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A QUANTITATIVE AND QUALITATIVE REVIEW OF THE IMPLEMENTATION OF A HEALTHCARE INFORMATION NETWORK

A GRADUATE MANAGEMENT PROJECT

SUBMITTED FOR APPROVAL TO

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The Integrated Medical Systems (IMS) Medical Automated Communications (MEDACOM) Project was initiated between PacifiCare of Texas (PCTX) and the many associated sites and locations of the delivery and financing of medical care in the city of San Antonio. The network allowed the paperless transfer of information between multiple locations such as hospitals, doctors' offices, and the like. It was also designed to link the locations where care was monitored and assessed, such as health services, and also where eligibility and claims are evaluated. Multiple separate organizations were electronically connected, including PacifiCare. They all are unrelated business entities and are bound together only by contractual agreements to provide services. None wished to allow direct communication to their systems by other corporations. Also, all of the companies have different proprietary software. PacifiCare hoped to link all the corporations electronically through the services of an intermediary corporation. PacifiCare selected the vendor IMS MEDACOM for the initiation of this health data network. The projected benefits from the initiation of this electronic network were all related to the increased speed of transfer and availability of data at the "user" level. These benefits included: (1) Secure transaction switching and networking from point A to point B, (2) Clinical communication such as referrals and lab data, (3) Payer communication such as claims status information. PacifiCare hoped that by electronically connecting the various healthcare entities, the patients would receive improved care through faster (electronic) referrals, ease of access to patient specific information, and decreased administrative costs. The scope of this healthcare project evaluation is limited to: (1) the appraisal of the financial benefits that accrued to PacifiCare as one of the network sponsors, and (2) The evaluation of the IMS MEDACOM software to show that it is indeed easy to use and a stable electronic communication system.

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Executive Summary

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"The chief aim of science is not to open a door to infinite wisdom,

but to set a limit to infinite error."

---- Berholt Brecht

Introduction and Literature Review

Both civilian and military health care organizations are still only in the beginning stages of attempting to leverage medical information. The two major goals of the management of that information are definitely worthy:

1. To help improve patient care at each and every site of the delivery of that care, and
2. Save transaction costs though increasing the efficiency of the medical system

Today, most organization are able to tie various components of their business together with communication networks. Distance, time, and location have become much less relevant.[1] In the health care industry, distance is still a relevant factor if one is attempting to move the patient. However, the opposite side of the spectrum is slowly coming to the forefront. Moving the information to the patient and their health care provider is finally becoming a more common occurrence.

The goal of informed decision making is accomplished primarily through having the most complete information available on each patient at every site of their care. Decisions and plans of further interventions are thus based on the best available information. However, the goal of improved care through information transfer is also realized when costs are avoided. Two examples are: (1) stopping duplication of effort through not repeating "misplaced" lab or radiology tests and (2) the expedited filing of accurate billings or claims. Additionally, electronic connections can allow other less well quantified efficiencies, such as electronically getting a report (like a mammogram) back to a requesting health care provider in an expedited

fashion. This allows the provider to more quickly relieve the anxiety of a worried patient or expedite the evaluation of an abnormal finding.

If the executives in the leadership positions of these organizations, be they administrators or physician executives, do not take the time to understand how newer technologies will affect health care both now and in the future, the organizations will ultimately "miss the mark" in the capitated environment of managed care. Ultimately, the patients will be the ones to lose out on improved outcomes and on operating efficiencies in the healthcare field. Additionally and equally important, clinicians must learn to include technology in their day to day practice of medicine. "Just as clinicians must learn to efficiently use superior diagnostic and therapeutic techniques as they become available, . . . so too must physician executives learn about standardized clinical lexicons and computer-based patient records (CPR), relational databases, . . . telecommunication technologies and the Internet. Also, clinicians need to learn about . . . outcomes management, practice guidelines for differential diagnosis, knowledge bases and electronic medical textbooks . . .."[3]

Table 1

Potential Benefits of "Electronic Connections" for: Managed Care Organizations[2]

- Automation of eligibility and benefit inquiries and referral authorizations;
- Improved relations with purchasers through participation in cost-containment efforts;
- More accurate and complete bill submissions, reduced errors or repetitions and lower telephone and mail costs;
- Faster claims processing for improved patient and client relations;
- Improved communications among referring physicians and specialists for better patient service and management of care;
- Acceleration of managed care review, admission authorizations, utilization review communication and claims processing;
- Computerized communication with group benefits offices for enhanced customer service with other healthcare organizations;
- Automated access to clients, such as employers, for enrollment updates and occupational health and wellness issues; and,
- Automated provider reporting and account reconciliation.

The historical transition that health care is undergoing demands more medical information than is contained on the Heath Care Financing Administration 1500 (HCFA-1500) and Uniform Bill 1992 (UB-92). It needs a system that can relate services, costs, human resources, workflow patterns, budgets, and the plethora of activities found in other sophisticated businesses.[4]

"Best Business Practices"

The influence of the business world with its emphasis on cost cutting and innovation as methods for improving services has had no small effect on the health care industry. The industries paying for health care are beginning to expect the same improvements and approach to innovation that other businesses have demonstrated. Tom Peters in "Crazy Times Call for Crazy Organizations"[5] commented on the fact that an important way to look at any job in any organization is to ask the simple question: "What information would I want to know in order to make informed decisions if I had that job?" The answer is often: "Much more than the person has at the present time!" If that is the case, then changing the amount of useful information available to that person can provide many potential benefits. These benefits may include better performance, improved customer satisfaction, and as the bottom line: improved cost effectiveness. This "cost savings" can then be reinvested into holding back the rising tide of health care costs. So, how do you get more information to the worker at the level where they need it? The answer often is twofold: look at changing business practices, and more often, leveraging the appropriate application of information technology.

Why Invest in Information Technology?

The unmistakable reasons to invest in technology were listed above. People often need more information "at their fingertips" in order to do the jobs required of them today. It is no longer a simple matter of "knowing" what the right answer is because you have worked at a company or area for years. There is a focus on providing increasingly individualized health care to individuals within a prescribed set of benefits. This ability for patients to choose options in their healthcare plan is felt to be the optimal method of providing care for patients.

The ability of the patient to employ choice in their selection of benefits creates a whole new challenge in attempting to administer the health care plan. The administrator, the myriad of providers and the individual settling claims cannot possibly remember each and every nuance of all the health care plans. Information about each patient's current plan coverage needs to be available to many individuals. Additionally, the ability to expeditiously review electronically transmitted data from tests on patients is now the norm rather than the exception, and is another excellent reason for an electronic connection between the information source and the care provider. "Health care is finally joining the rest of society in realizing the improvements of electronic linkages: increased accuracy to help eliminate misadventures, the ability to access data and respond to it in a speedier, "real time" manner, and the creation of researchable databases to put the information collected to use to find out what works and what doesn't."[6] Information available at the "consumer -- provider interface" is the correct answer. If you are a health care provider, that information could be lab or radiology data. If you are a customer service representative, it could be having the billing records for the patient and an "on-line" manual of

their health care plan to review their benefits with them. If you are the claims clerk, it could be the ability to send a query electronically back to someone to clarify a line item on a bill, receive an electronic answer, and not wait "on hold" on the phone for 20 minutes to get the answer.

The changes within the healthcare industry in the area of information technology (IT) offer a challenge and a significant opportunity to those healthcare organizations that are willing to invest some time and talent. To paraphrase Carol Fronduto,[7] the focus of these efforts must involve:

1. The creation and use of "robust" systems: those able to do the work of today, yet having the flexibility to expand to meet the need of the future. This potentially involves the use of modular systems, and also requires the use of standardized hardware and software that follows industry standards (able to upgrade the system, and open architecture systems).

2. Integration of added systems with currently functioning systems. Requiring someone else's organization to spend large amounts of money to connect electronically to your equipment is not generally considered a viable solution to leveraging healthcare information.

3. Communicate your ability to connect to other systems so that you and other organizations know they can leverage information jointly. If no one realizes you potentially can and want to connect electronically to them, they will not even try to connect. The overall goal of information management in the organization must be to look at: (a) what exists in the current operating environment, (b) where the organization thinks it wants to be in 3-5 years, and (c) reviewing whatever "gap" exists in these two views to see if it can be bridged. Again, that simple question: what information does the decentralized worker need to have to do a good job and to make informed decisions?

In general, hospitals have done a better job than physicians' offices of trying to create, integrate and update systems in order to improve communications. In fact, Everett Hines of Coopers & Lybrand's Integrated Health Care Consulting Services says, "To date, the emphasis on healthcare information has been on inpatient services . . . with outpatients -- some 40% -- (of the information) largely left out of the loop."[6]

Table 2

Potential Benefits of "Electronic Connections" for Hospitals[2]

- Improved efficiency of ancillary departments, admitting and medical records through reduced telephone queries and responses;
- Savings in mailing, handling, printing and other report delivery costs by replacement with electronic transmission;
- Faster medical record completion, filing of bills and reduced account receivables through electronic signature;
- Enhanced pay-back on the investments made in hospital information systems by increasing physician and other third-party connectivity;
- Improved relations with physicians through better service and communication;
- Easier compliance with managed care contract protocols and procedures;
- Shorter length-of-stay, reduced costs of duplicated tests and better financial results under diagnosis-related group payment systems;
- Improved quality of care through faster reporting of test results and initiation of therapy; and
- Enhanced image among purchasers and general public as a responsible partner in containing costs.

It would also seem quite easy to predict that the amount of information will greatly exceed that 40% figure as we move health care from an inpatient to an outpatient approach. So, how do these connections happen? According to a survey conducted by the Health Information and Management Systems Society of 1200 health-care professionals, the greatest focus will be: upgrading infrastructure (32%), integrating multivendor systems (27%), re-engineering front-office systems to provide better patient care (23%).[8] The broader question though, is how do we "use technology to invest people with. . . [information], knowledge, and understanding of the processes in which they are working to allow them to exercise intelligently the prerogatives of

empowerment?"[9] The value of information provided in the database depends on its accuracy, reliability, timeliness and completeness.[10]

To this point, many companies have managed to meet some of these criteria, but not all of them. Individual corporations have begun the process of attempting to meet these goals through proposals like the Integrated Medical Systems (IMS) Medical Automated Communications (MEDACOM) Project at PacifiCare. In 1992, only 14% of any of the bigger HMOs like Kaiser Foundation Health Plans in California had, or were in the process of developing local HINs.[11] This may be appropriate according to Joe Ferguson, the vice president of CHC, an international supplier of information systems, since there is generally a ten year life cycle for information system technology.[12] As these systems are replaced, healthcare institutions will look towards standardized systems and open architecture to allow interoperability. However, recent legislation may force some changes in these systems sooner than some companies had planned.

Recent Legislation

One of the most significant, yet barely noted components of the new Health Insurance Portability and Accountability Act passed in 1996 is the aspect of Administrative Simplification. This portion of the Act mandates: (1) a new unique provider identifier and (2) standards for data interchange. Under the new act, the U. S. Secretary of Health and Human Services must set standards for the following types of information transactions: claims, claims attachments, enrollment and disenrollment, eligibility, payment and remittance advice, and premium payments, based on standards already adopted by the American National Standards Institute

(ANSI) and others. Implementation guidelines must be adopted within 18 months of the enactment with penalties for noncompliance. In addition, standards for electronic transmission and authentication of signatures must also be adopted.

Standards: One Stumbling Block

It is not as if individuals have not worked on attempting to set up standards. Others are trying to integrate "older technology" through the use of "new technology," so that what is currently in place can still be used. An example is the HERMES (HEalth and Research MEdical System).

The HERMES facilitates the integration of several existing databases and applications without modifying them. Data from different sources on a network can be combined and directly used in existing applications or in one developed for integration of data provided.[13]

The motivation for the HERMES project was fairly straightforward: requirements to attempt to combine databases from hospitals, departmental information, laboratories, research databases, EKG management systems, and picture archives. Multiple limitations were put on the developers. One requirement was to attempt to develop a new framework that would simply integrate and not replace what was already in place. Thus the basic function was to integrate existing (commercial or proprietary) applications, leaving them unchanged. The second requirement was to make sure that the integration of new and revised replacement applications could be accomplished into an extendible and changeable architecture of the HERMES, and would not interfere with the older applications that are already integrated into the system. Third, a centralized data model was included that allowed the incorporation of several "legacy" systems

into one logical patient record. Fourth, HERMES provided a graphically friendly and uniform access to data and applications from a clinician's work desk. Fifth, tools have been developed into HERMES to support building advanced, open architecture systems seamlessly in the future. So why hasn't everyone "hopped onto" this type of project? There are still multiple barriers to implementation. In spite of the efforts to accomplish this project or others, there is resistance to change. This comes from people who do not want to have to use the new technology and from individuals who have already invested money in one form of electronic information that may not be compatible with other systems.

The largest barrier to the integration approach according to the individuals developing HERMES is the resistance from different vendors at the point where they have to agree: at the communication links between the applications. Management of duplicate data is still a problem. Finally agreement on semantic integration, that is, on the meaning of variable names and data values to insure consistency and correctness of data is still an issue.[13] So as you can see, this project, as one of many with similar ideas is moving forward, but encountering resistance at several locations. The ultimate goal of any networking project would obviously be a completely "seamless" environment that provides whatever data you need with the touch of a few intuitive keystrokes or mouse clicks.

Why Aren't Systems Already in Place?

In many cases, this "seamless" environment is still less than a reality and more of a dream even in systems that are up and running. In 1994, hospitals spent $7 billion on information systems, approximately 2.5% of industry revenues.[14] In spite of this amount of money spent,

and even with Charles J. Singer & Company estimating that these expenditures will increase to 5, or even 7 percent in the next five years, there are still systems out there that receive much more abuse than praise. Why is this? Peter Van Etton, President and CEO of Stanford Health Services, thinks the answer is: "Rarely do healthcare providers proceed from a clear and complete understanding of what these systems are going to do to effect change within their organizations. The prevailing tendency to view systems as solutions in themselves, . . . dooms most of these investments . . .."[14] Thus, the simple problem boils down to individuals continuing to think that the installation of a computer system is what needs to happen. Instead, Van Etton contends the first goal should be to understand the process and look at how the installation of a computerized system will change and improve how the process is being accomplished. This requires all managers to look at information flow through their areas. Companies cannot rely on an information management officer (IMO) as the only person to design a system. It requires all the involved individuals to explain the current process and the goal(s) for improvement. The IMO should then spell out exactly how what the managers want to do can be accomplished. This discussion may result in additional enhancements or in a complete revision of the original operation. This process improvement needs to be the goal. The objective would then be a measurable enhancement in the way something is accomplished. Also, the operating managers need to be held accountable for the results after the system has been put in place.

A simple example from a different environment may help show this point of process focused improvement. The Composite Health Care System (CHCS) is an electronic database and patient information system that is being installed and is undergoing beta testing or beyond in most of the Armed Forces Facilities. Although it has many areas that need improvement, not the

least of which is the lack of a graphical user interface (GUI), "CHCS is revamping the total processing of information for medical treatment facilities by providing a complete patient management database within a single integrated hospital information system."[15]

One of the fundamental processes that the military wanted to change was to eliminate almost all hand written orders for things like labs, radiology exams, and prescriptions. In hospitals with full implementation of the CHCS network, this is now a reality. The pharmacy module (an order entry system for prescriptions), allows for improved handling of medications, warnings of possible drug interactions, and provides a complete record of an individual's medication history. At many facilities the average wait to get a hand written prescription filled was 30 minutes or more depending on the time of day you arrived at the prescription window. With CHCS, the order is entered at the physician's console, screened against a database of the individual's current and past prescriptions that may cause drug interactions, and then electronically transmitted from the doctor's office to the pharmacy. At the pharmacy the prescription is filled by machine, the label is generated from the electronic order, and only then does the pharmacist or assistant become involved in order to dispense the prescription. The result often is that the patient is dispensed the medication on his initial arrival at the prescription window with no waiting involved. The entire process has been improved, resulting in better accountability, better patient care through electronic drug interaction screening, and has been accomplished with what the patient perceives as an improved response time. Additionally, the number of prescription written but either not filled or not picked up by the patient (non-compliance) can be tracked. The particular process of noncompliance in the area of prescriptions not being submitted to the pharmacy once they are written has been almost impossible to look at

in the past. This type of overall multilevel process improvement, should be the goal of any electronic integrating, networking, or electronic medical record project.

What's the Holdup?

The barrier most often cited in the successful implementation of any electronic transfer of information system is the resistance of the clinicians themselves (especially in the area of computerized medical records). Often the clinicians have taken the attitude of: "bring me something that already has been proven to work," and "oh by the way, I want to change nothing that I currently do." As discussed above, this failure to look at ways to improve whatever process is being automated will often result in negligible improvements, and often "locks you in" to a process that is inherently inefficient. Any solution that is not comprehensive and integrated will quickly become obsolete. It will also be difficult to install because the necessary buy-in by the users will never occur. Physicians have to see the advantage of the system and must be involved in putting together any request for proposals and in evaluating the software. This is key in understanding the clinical process, since once the software is going to be implemented, it needs to fit the pace of the practice of medicine, not impede the process. Physicians should not have to, want to, or be able to work around the technology. They must use it once it is implemented. Otherwise you lose the advantage of the potential improvements.[16]

However, physicians <u>are</u> becoming more receptive to the idea of electronic information databases, electronic medical records and computerization. There are several reasons that are moving physicians in the general direction of acquiring electronic connections. (Adapted from Gleiner)[17]

These forces for change include:

1. Information overload,
2. Market pressures,
3. Patient expectations, and
4. The need to practice analytic and scientific medicine.

Information overload - Charts are now filled to the brim with data, much of it in illegible scribbling. Additionally, the charts are often "organized" in an order that may defy the logic of anyone except the originating clinician. This information about the patient's health must be accurately and completely recorded in a legible fashion using standardized terminology. Organized information gives it additional meaning and context, thus elevating it from mere data to knowledge. Clinicians are slowly becoming cognizant of this requirement and advantage.

Information stored in a form that allows retrieval and revision without the loss of the original meaning is a necessity. Charts used to serve as a reminder of a few details of a visit. However, now they are medical-legal documents, compelling a comprehensive account for that same type of visit. Consequently, the amount of information, and the external requirements imposed by quality assurance to be able to easily retrieve that information, make a paper record at least impractical. There are many who believe that perhaps the paper record is obsolete in this increasingly data driven society.

Market pressures - Information technology can help solve all the problems of duplication, necessity, and outcomes analysis, and prevent any loss of information. More importantly, capitation allows managed care organizations to be rewarded financially for providing this technology, and the MCOs in turn may pass this cost savings on to the patients through better quality care at lower costs.

The role of the regulatory agencies also cannot be ignored at this point. They are already setting standards that are impossible to achieve or report accurately without information systems.

Table 3

Potential Benefits of "Electronic Connections" for: Clinics[2]

- Improved efficiency of staff through reduced telephone queries and responses;
- Savings in mailing, handling, printing and other report delivery costs by replacement with electronic transmission;
- Improved communications among referring physicians and specialists for better patient service and management of care;
- Faster medical record completion, filing of bills and reduced account receivables through electronic signature;
- Easier compliance with managed care contract protocols and procedures;
- Enhanced image among purchasers and general public as a responsible partner in containing costs;
- Acceleration of admission authorizations, utilization review communication, claims processing and managed care review, increased patient compliance with filling prescriptions and following instructions;
- Documentation without duplication through the audit trail of document transmittal and the ability to print and retain correspondence; and
- Potential access to and use of multi-participant network to receive lab reports and other medical records, request documents, order prescriptions, complete supply requests, etc.

Patient Expectations - If someone can pick up a phone and have the pizza person at the other end of the line ask him if he wants the same items on his pizza as the last time, what higher expectations are coming down the line about health care? More and more, we need to be able to make "real time" information readily available to the individual talking to the patients. Peter Van Etton argues that perhaps we are over infatuated with this idea of "real time access."[14] Real time access of data does require a significantly higher level of hardware and software complexity, and the more data you want in this type of format, the greater the complexity of the system required. However, many pieces of information must be "real time" to be useful. A "middle of the road" position, allowing for some data to be real time, and for other data to be archived and take a little longer to recall is no doubt the correct answer on this issue.

The need to practice analytic and scientific medicine - Without the continuous entry of reliable, quality data into the system, obtaining valuable trends and other useful analysis out of the accumulation of that data will be impossible. Any hope of obtaining and using reliable data to increase the quality of the care we give by determining what is a best practice will never happen if data entry is not continuous and complete. Data needs to be easy to enter, or even better, not require any human intervention at all to get into the system. Data that is collected automatically is obviously the most reliable, as there is no chance for operator error. Then, being able to easily access the data to put it in a form that is coherent, shows trends, or other useful facts, is key to the data becoming information.

Some Rules to Follow

When attempting to put together requirements for what you want to see in terms of data, several general rules about available numbers and facts should be considered.

Ways to use data wisely:

1. Focus on specific goals: performance indicator reports, reports to support guideline implementation, etc.
2. Get data from a variety of perceivers . . .. Consider whether raw numbers or percentages are more informative. Graphs are often easier to perceive or understand. (Graphic functional form)
3. Always let people compare data to a benchmark: the previous year, another site, etc. Millman & Robertson, for example is a famous benchmarking firm.
4. Stick to a reporting schedule to keep people interested in the data. (On the opposite side, if people complain they did not get it in a timely fashion, you know it is being used.)
5. Make sure the data are timely. You can get perfectly usable numbers after two months, with 95% of claims in, because a 5% difference is not substantive in determining changes in utilization.
6. Allow for disease severity, but remember everyone is biased to thinking that their diseases are "above average severity."

7. Remember that the information systems (I/S) department is a vendor, and that the I/S department needs to produce data in the format that the users want and need.[6]

Get "Buy In"

Cost effective care requires physicians to be trained to survive in the health care patterns of today. There are five areas of concerns or topics that the newly formed American College and American Board of Managed Care Medicine feels must be the core competencies of the successful" physician. A successful physician has the ability to increase the value and quality of the health care given to patients. Training in these fields should help the physician provide that increased value.

These topics include:

Disease Management,
Health Care Information Systems,
Delivery Systems,
Health Care economics, and
Health Care Financial Management.

The courses set up around these topics are designed to allow the physicians to increase the efficiency of their practice of medicine.[18]

If the physicians do not understand how to organize, relate and exchange information, and do not demand that it happen as a normal course of setting up a practice, a network will usually not develop. The method of getting the information network initiated may vary in different locations and be championed by different individuals. However, the physicians are the major players in using the data, reporting it accurately, and seeing that the system is easy to use, both for them and their employees.

Table 4

Potential Benefits of "Electronic Connections" for: Medical Practices and Physicians[2]

- Dramatically reduces staff time spent obtaining clinical, diagnostic, and administrative reports;
- Automates access to eligibility, benefit and co-pay information;
- Permits prescription initiation and refill authorizations;
- Expedites submission of claims, encounter forms, referral authorizations and other information to payers;
- Facilitates the delivery and exchange of critical patient information among referring physicians and specialists, allowing diagnostic and patient management decisions to be made quickly;
- Eliminates unnecessary patient and family anxiety by expediting the delivery of diagnostic results;
- Increases patient compliance with prescription usage by making important pharmaceutical information available at the point-of-service; and
- Allows in-office medical records completion and electronic signature via computer.

Physicians must be trained in the use of the computer, just like everyone else. The American Academy of Family Practice feels that being able to use computers is an increasingly important skill in the area of information management. They have published "Core Educational Guidelines for Family Practice Residents"[19] (See also: Appendix H). Their goal is to make sure that graduating Family Practice (FP) trained physicians can make use of up-to-date, accurate information in an electronic format. This information should be made available in some format to all members of the health care community. Each particular organization and community is unique; unfortunately there is no one strategy that will work in all market environments.

Clinicians not the Only Holdup

Not everyone however, is cheering the concept of sharing of information. In many circles the word Community Health Information Network (CHIN) is looked at as a "four letter word!" The overriding concern and reason for much of the controversy is simply competition. Polly

Schneider, in a ComNet Society study released earlier this year, indicated that the biggest barrier to the implementation of CHINs is the "resistance to share data due to competitive issues." The concept of a central database running on a proprietary, single vendor network with "open, seamless sharing of administrative, clinical, financial and educational information in a standardized electronic format" has left many organizations very uncomfortable.[20]

Thus, depending on the individual's position, either the proprietary software, the clinician, or the company that does not want to share information due to a competitive issue, is the "biggest" impediment to the implementation of any kind of a health network. Each of these potential impediments exist in a location where a Health Information Network (HIN) is under development; each hurdle has to be cleared. Even with these impediments, many locations are managing to make their HINs work, although they focus on more limited functionalities, such as the sharing of test results, transcriptions, and other patient data, and for e-mail. Electronic claims submissions and other financial tasks are also increasing in volume.

Table 5

Potential Benefits of "Electronic Connections" for: Local and Regional Clinical Reference Laboratories [2]

- Improved customer satisfaction due to the timely, accurate delivery of results; paperless forwarding, filing and finding of reports; reduction in customer frustration with dedicated printer; and access to other network participants;
- Ability to more clearly focus on core business while outsourcing hardware installation and support to local MEDACOM business unit;
- Reduction in deliveries to wrong offices;
- Enhanced revenue from increased business from "non-contract" customers;
- Competitive advantage over non-networked laboratories;
- Improved communication with physician office customers;
- Reduction in support calls through providing offices with answers to frequently asked questions such as courier pick-ups, third-party payer information and satellite locations;
- Increased test completion rate through the ability to provide current test preparation and instruction information;
- Improvement in operating margins by reducing the costs associated with report delivery (telephone lines, printers, modems, cables, courier, installation, support);
- Enhanced ability to document result distribution; and
- Reduced telephone calls, as well as time spent on hold.

Future Direction

The health care field is perhaps more information intensive than any other business. Providers are recognizing that perhaps the integration of that information will provide an advantage both in terms of patient care, and in terms of an improved financial bottom line that is realized through efficiency. Yet, health care organizations have traditionally ranked last when compared to any other industries in the area of information technology investments. "It is likely that the health care industry is between 10 and 15 years behind the financial industry for example, in regard to the development of community and national information highways. Health care, health care technology, and information technology are all changing rapidly. The development of the strategy for health information networking of any community will require a flexibility to achieve the end result of interconnectivity."[21] Robust systems, that can meet the current requirements, yet still grow to adapt and integrate today's systems with

tomorrow's new and improved ones are the answer. It is believed that the move toward cooperation will continue as organizations realize that rapid, accurate information exchange promotes efficiency and customer responsiveness, provides higher levels of satisfaction with healthcare services, and yields a greater profit.

Stakeholder participation and the overall goal or scope of the project in attempting to get a HIN organized will affect the approach taken to organize the network.[22] The approach usually consists of one of four major strategies:

1. Coalition Strategy: This is a group effort, with either a formal or informal collaboration of multiple diverse stakeholders with the mission of improving community health status and thus lowering overall costs.
2. Enterprise Strategy: A single stakeholder links all its owned and affiliated enterprises. The goal of this networking parallels the corporate business strategy.
3. Vendor Strategy: This is a direct response to the immaturity of the HIN market. Vendors are leveraging core technological competencies and are creating HINs through a variety of business arrangements. The vendor approach outsources the HIN operations, thus leveraging the vendor's resources and reducing the capital costs and risks. Vendor support can be provided in a number of ways: consultation, training, active research and development, maintenance of local branch offices, technical support personnel, and continuing enhancements.[23]
4. Virtual Strategy: The linking of existing HINs is the focus here. Establishing connectivity between different constituents through the linking of several databases creates a "virtual" sharing of health data.

Recent Federal legislation will encourage companies to move in the direction of open architecture and compatible systems that can expand and integrate. Thinking through the processes of how to improve patient care and referrals, billing, and the myriad of other transactions that occur in health care must be the impetus behind the potential explosion of money and time forecasters say will be dedicated towards "information management." Let's make sure we manage the right thing, improving the processes as we "merge " onto the information highway.

IMS MEDACOM Project Evaluation

PacifiCare of Texas decided last year to become a member of a HIN in the city of San Antonio. The pilot phase and the full roll-out of the PacifiCare portion of the HIN occurred over the last 6-7 months. The purpose of this Graduate Management Project was to evaluate the benefits of the implementation of the PacifiCare San Antonio electronic healthcare data transfer network. The analysis planned included implementation pitfalls, successful usage, subjective ease of use, and objective improvements realized, with an analysis of cost/benefit results. The Integrated Medical Systems (IMS) Medical Automated Communications (MEDACOM) Project was initiated as a means to develop an electronic communication gateway within the San Antonio area. This electronic gateway was initiated between PacifiCare of Texas (PCTX) and the many associated sites and locations of the delivery of medical care as well as the reconciliation of that medical care. The network was begun to allow the paperless transfer of information between multiple locations such as hospitals, doctors' offices, and the like. It was also designed to link the locations where care was monitored and assessed, such as health

services, and also where claims are evaluated, where inquiries on bills and eligibility data are a way of life.

Some of the locations to be interconnected included the physicians that work with PacifiCare (see Appendix A for a description of the company), either directly as Primary Care Providers (PCPs) or subcontracted to those PCPs, and the respective Medical Services Organizations (MSOs) for those providers. Also to be included in the interconnections were other care providers such as hospitals, radiology and laboratory facilities. All these separate organizations, including PacifiCare, are unrelated business entities bound together only by contractual agreements to provide services. Each of the organizations did not wish to allow direct communication and in fact, blocked access to their systems by other corporations. Also, all of the companies had, and continue to have, their own various different types of independent, proprietary software.

To help lessen the frustrating non-uniformity of the respective proprietary systems, PacifiCare hoped to link all the corporations electronically through the services of an intermediary corporation. PacifiCare selected IMS MEDACOM for the initiation of this health data network. IMS MEDACOM has many years of experience in the electronic networking field. They are a corporation that is a proven vendor in the area of electronic communication, and have already set up other working networks, both here in San Antonio, and in other cities.[24]

The projected benefits from the initiation of this electronic network are all related to the increased speed of transfer and availability of data at the "user" level. The time and money spent to transfer information is called a transaction cost. Electronic networks are designed to decrease transaction costs.[25] The increase in information provided to the lowest possible user should

result in a time savings to that individual, since that person either does not have to request information from someone else, or can receive the information in a more timely manner, and in a more versatile electronic format. Prior to the implementation of a Health Information Network (HIN), certain information may be available to a single user. This information must to be transmitted by phone, fax, or mail (paper, tape or disk). This process of requiring one person to request the information they need from another individual is commonly referred to as an efficiency loss. Changing the data flow system so that the data electronically goes to anyone who needs it should result in an increased efficiency. There should also be a time savings (and perhaps a monetary savings through potential job elimination) for the individual who used to be the only one with the information. This individual now does not have to stop whatever they are doing to provide the information requested. Examples of specific goals in the development of this program are those that are generally listed under the simple transactions section of a network:

1. *Transaction switching and networking* is the technology capability that allows information transfer from point A to point B. It involves sending, converting, accessing, and responding capabilities, and includes translation, reconfiguration, and security features. (The secure transfer of information between systems that are not always compatible.)

2. *Clinical communication* is a technical and more specific version of transaction switching and is the ability to move patient specific data among providers based on established parameters or specifications (Referrals, lab data, and approvals.)

3. *Payer communication* is the ability to transmit or receive referrals, claims status information, and other payer oriented data.[21]

The bottom line in a health care environment is that patients should receive improved care. This should come about through faster (electronic) referrals, ease of access to patient specific information, and decreased administrative costs by eliminating having to search for or repeatedly try to obtain information.

This particular effort will discuss the proposed goals and objectives of the network and provide a quantitative and qualitative analysis of the implementation. Achievement and quantifying of specific contractual goals will be addressed. Equally important is the somewhat less quantitative and more qualitative evaluation user satisfaction with the software. This is a significant concern in the evaluation of any software implementation. The "ease of use" and other concerns of the end user are important in the use or lack thereof in any software implementation. If a particular piece of software performs a function it is designed to do, but requires large amounts of complicated training prior to use, or is unstable and occasionally loses large amounts of data, it is hard to say that an "end user" will likely use it.

Attempting to document administrative savings is one of the most important phases of any implementation of a new product. The evaluation stage after the implementation of the product attempts to see if the goals set prior to the implementation of the project were met. This is key to understanding if the result was "cost effective." Quite often this step is neglected or given only a cursory evaluation. This makes it difficult in some situations to decide not only if the goals set originally were met, but also if any cost savings or some other positive benefit was achieved. Equally important, originally unrecognized advantages or outcomes also need to be determined and quantified when and where possible. Fortunately, in this particular case of the implementation of the data transfer network, the original goals and objectives for the

implementation of the IMS MEDACOM project were set in the planning phases prior to the implementation of the contractual agreement between IMS MEDACOM and PacifiCare. Thus, these goals and objectives can be used as the "starting point" for an evaluation.

Hypothesis

1. The implementation and use of IMS MEDACOM will result in improved information transfer from PacifiCare to and from the organizations that contract with the corporation.
2. The cost of the implementation of the project will meet or exceed the average Return on Investment (ROI) for corporations with some degree of automation already in place. This figure is reported to be in the 30-50% range.[26] 3. Finally, the users of IMS MEDACOM will evaluate the software as being convenient and easy to use.

Uses of the IMS MEDACOM Software at PacifiCare

In general, other than data transfer, the biggest use of the IMS MEDACOM system at PacifiCare is as another means of communication that does not require someone being immediately available to receive a message. Thus, questions, clarifications, and responses to others' inquiries are the major uses of the software. In this respect, many may consider voice mail to be an equal modality. However, the ability to "cut and paste" an e-mail response from a Primary Care Provider (PCP) group practice into the PacifiCare proprietary software about any patients' complaint or concern is an worthwhile feature. An electronic copy of a computer generated preformatted report from the PCP group is far better in many respects than having to retype the report into the PacifiCare system from a person's spoken, mailed or faxed comments. Another important result is that exactly the same documentation of the information resides in

both locations. (This is something that those who have been through a National Committee on Quality Assurance (NCQA) evaluation would definitely appreciate!)

Other information such as attached messages or forms are also able to be transferred. Spreadsheet files or word-processing files can be transmitted without a problem. Digital image files can also be attached and transferred with messages.

Table 6

Potential Benefits of "Electronic Connections" for: Professional Associations[2]

- Enhanced networking opportunities and general communication by providing members with more convenient access to officers and each other;
- Cost savings from reduced postage and paper, and time associated with mailings;
- Increased service to members by distributing seminar or meeting notices, fliers, reminders, minutes, job listings, lists of preferred vendors, etc., over standard telephone lines to computers or fax machines;
- Improved ability to stir up grassroots support for pending legislation and coordinate responses to issues pertinent to your chapter;
- Ability to outsource network operations to local business unit;
- Time savings and efficiency enhancement due to less time waiting on hold, playing telephone tag and standing over the fax machine;
- Enhanced ability to provide continuing education opportunities to members through electronic course catalogues, calendars and electronic bulletin boards;
- Improved communication and effectiveness among officers and committee members; and
- Access to other network participants.

Many of the other uses of the software are transparent PacifiCare users. Eligibility data is transferred automatically to the PCP groups. Additionally, it is now updated daily instead of approximately every two weeks. Since the eligibility data is now "easy" to send electronically once it is generated, additional groups who did not get this information in the past due to the time consuming nature of providing it, now do get it. This reduces calls directly to PacifiCare to check patient eligibility status, and also decreases calls to the "Voice Response Unit" (VRU). The VRU is a relatively easy way to check eligibility on one patient (a 1-800 number) but is very time consuming when

attempting to check on more than one patient's eligibility. The time savings here are two fold: less time spent on the phone by PacifiCare employees to answer eligibility questions, and less time spent by the ancillary staff at the PCP and specialist offices waiting to check on eligibility information. Since the software is provided free by IMS MEDACOM to the physicians' offices, and troubleshooting of the software and the installation is provided by the IMS MEDACOM employees, the only real cost to the specialist and PCP offices is limited to any additional hardware (additional workstations or separate phone lines) they may wish to install. A few offices running certain types of software still have some connectivity problems. However, the installation of a 486 or higher speed Windows® based computer and a dedicated phone line will insure the office is connected to the network. Once connected, physicians can also use the prescription module of the software to send prescriptions directly to pharmacies. The physician can also order laboratory and radiology tests and receive the results of those tests across the network. Transcription summaries of recent hospitalizations can be requested and transmitted back to physician offices. Santa Rosa Hospital has used the IMS MEDACOM connection for over two years now. The Baptist Hospital is in the process of upgrading its internal network to allow similar functions and ease of use, and has recently joined the network. Elective hospital admissions can be set up and authorization numbers confirmed over the system. Santa Rosa has even connected their medical library to the IMS MEDACOM net, allowing physicians to request information on topics of concern. (See tables for lists of capabilities and advantages to various entities).

Discussion of Software Introduction

The introduction of any new healthcare management information system (HMIS) can stimulate fears and create resistance to the new system. Dickson and Simmons discussed five different factors contributing to resistance to new HMIS implementation.[27] (1) New system efficiencies could result in job losses or departmental restructuring. (2) The balance of power may shift as the informal relationships in the organization change just as much as or more than the formal ones. (3) In general, younger, less experienced workers are more likely to accept change than the more seasoned or long term workers who have been in the organization. (4) Previous organizational experience with new software implementation will influence the acceptance of the new system. (5) Finally, how the software is implemented will influence acceptance. User orientation, adequate training and education, and especially participation in system development will minimize any resistance to implementation.

Discussion of the Evaluation of Software Introduction

Objective evaluation of software implementation is extremely difficult to achieve.[28, 29] Obtaining user evaluations of the systems as a surrogate for success are therefore often used in place of objective evaluations. In order for evaluation to be successful, the "fit" of the new software (technology) to the job it is supposed to accomplish (task) is the goal that has to be measured. This task-technology fit (TTF) has been proven as a method of evaluating software. TTF has been shown to be an evaluation of the inherent qualities of the system. TTF also is a measure of the extent to which the system meets the users' task needs and their individual abilities. Users need information systems to contain correct data at the appropriate level of

detail. The data needs to be organized and easily retrievable. Additionally, the meaning of each of the data elements must be clear.[28] Reported satisfaction is directly proportional to how many of these criteria that are met. Andrew Sears suggests the "user interface" is one of the most important criteria for acceptance of software.[30] The simplicity and appropriateness of the screen layout, and data being where the users "expect" to find it is the key to ease of use. Hubert Austin has described the three management visions for information technology in a hospital: automate, informate and transform. He then suggested seven different assessment procedures for a hospital executive to use to determine which vision may be the most relevant for the hospital and how to evaluate each of the information management technologies.[31] Kekre et. al. discuss similar issues as Goodhue and Austin, but they use slightly different terminology.[32] Kekre's team determined that overall customer satisfaction with new software is based seven major factors:

- Reliability (works without "crashing")
- Capability (does the software do what the consumer needs done)
- Usability (In this case, is it consistent with the accepted standard performance of other similar software)
- Installability (ease of installation; in the case that the vendor installs the software, this is obviously the easiest)
- Maintainability (if a fix I needed, how easy is it to obtain, install and the service received)
- Performance (efficient use of memory, and efficiency in processing speed are essential)
- Documentation (easy to read manuals, and also instructions in how to use the software, especially with novice software users)

While all factors are important, customer satisfaction is based primarily on the capability of the software, and on the usability that the customer perceives. HIN vendors should focus on these two factors. Satisfying the customer with capable software, that is intuitively easy to use, should result in a successful network.

Evaluation of IMS MEDACOM Software

Methodology

With all the prior factors in mind, the evaluation of the IMS MEDACOM Project can be broken down into the following areas:

1. Software functionality: Did it work?
2. Software acceptance or user utility: Did the users feel the software was easy to use and gave them valuable information with a minimum amount of learning, upkeep, or problems? This area is slightly harder to evaluate due to the varied number and types of internal and external user locations. Equally important was the fact that the PacifiCare users had a new Windows® version of the product while the end users had the older, yet fully tested and functional DOS version of the software. The "user utility" requires a survey in most cases to evaluate (See Appendix C).
3. Were there any documented savings in time, equipment, paper or the like? Since PacifiCare is the company actually paying for the service, this was evaluated for the most part on the PacifiCare side of the electronic connection and was the easiest to evaluate in an aggregate form. This involved looking at a process prior to information transfer via IMS MEDACOM, and then afterwards, to look for a cost savings in personnel time. It should also be somewhat obvious that pushing information out automatically to the end users in a functional format will cut down on the end users' attempts to contact any central information dispensing area. This saves time and money for the end user who now does not have to request the information, and eliminates the requirement at PacifiCare to manually generate or send the information.

A survey at Appendix C was originally planned to evaluate the end users perception of the software. The survey was to capture any changes in usage and comfort with information received from PacifiCare and determine their feelings about the software product and the information received. This survey was never fully implemented due to difficulties in getting the original project off the ground. Instead a more informal survey conducted in person by myself was done to ascertain the individual users comfort level with their new software and to address any questions regarding usage.

Finally, a time analysis was performed on the time spent by employees at PacifiCare who used the new software. This effort was designed to determine time spent prior to the IMS MEDACOM project for a particular information transfer process, and the time spent afterward the implementation of the software and a "process" change. Faxing time and phone time costs were estimated and paper costs were also evaluated.

The salary of the person in charge of the implementation of the project and the individuals involved in several of the planning meetings should also be included as implementation costs (one time or "sunk" costs), but not as long term (regular) costs for project continuity. The cost of additional system functionality development and product support once IMS MEDACOM is up and running should be included as a continuous or ongoing cost.

Evaluation of IMS MEDACOM: Cost Calculation Methods

Ongoing costs to continue IMS MEDACOM

PacifiCare payment: $46,000 per quarter (based on a capitated rate).

Cost savings realized once implementation complete:

A. Savings: Customer Concerns and Complaint report

Daily time spent faxing Customer concerns and complaints (average of 20 days per month). Three hours per day to separate and fax or interoffice to 25 different locations Salary for that individual ($11.60 = average salary)

Calculation: 20 days/month X 3 hr/day X 11.60/hr X 3 months/quarter = $2088.00

B. Daily time spent faxing AU209 reports. These reports, sent to physician groups list ongoing authorizations for individuals that are either hospitalized, in a nursing facility, using home health care, or are using durable medical equipment. It also lists the number of days they have been in a facility or using a service. (average of 20 days per month) 15 minutes each (3 people) Salary for those individuals doing this faxing (average = $11.60)

Calculation: 3 persons X 15 min./person X 1 hr/60 min. X 20 days/month X $11.60/hr X 3 months/qtr = $522.00

C. Monthly time spent mailing out AU441 reports. This report is a monthly rollup of the AU209 report. The accuracy of the AU441 obviously increases if the AU209 report is corrected on a daily basis. Estimated time spent 15 minutes (1 time per month)
Salary for that individual $11.60 Calculation: 1 person X 60 min./person X 1 hr/60 min. X 20 days/month X $11.60/hr X 3 months/quarter = $36/quarter

D. Twice a week we generate a "no auth log" which is a listing of the claims received by the PacifiCare claims department that have no authorization number listed in the authorization system. This listing is then faxed to the groups for them to review for accuracy and correction. (29 different groups) 20 minutes each time the list is generated Salary for the individual sending the faxes = $11.60 Calculation: 2 X 13 weeks/qtr. X 20 minutes X 1 hour/60 min. X $11.60 = $100/quarter

E. OB notification: Prior to the IMS MEDACOM network, new pregnancy notifications were sent via mail or fax to the PacifiCare medical information coordinators (MIC). The MICs would then enter authorizations into the PacifiCare computer data base, and when the bill for the patient's hospitalization for OB care was received, everything matched. Unfortunately, often the notification was lost, not sent or otherwise was "waylaid." The process also broke down internally, since customer service also was supposed to arrange for an identified primary care provider for the soon to be arriving child. This communication more often than not, failed to occur

New pregnancy notifications are now sent electronically from the obstetricians' office to their management service organization (MSO) and to the PacifiCare MICs for inpatient authorizations. Additionally, a copy of the routine notification of a new pregnancy is now automatically sent to customer service by the OB physician's office if no physician for the pending baby has been identified by the mom. The customer service center now receives the information automatically and can contact the patient and arrange to send them a listing of potential physicians (Family Practice or Pediatricians) close to their home or work. Result: no paperwork, and real time notification.

OB Calculation 1 : Paperwork/ mailing expense to send approximately 100 OB notifications per month: (about half sent via mail, and half faxed them). Fifty/month X 3 months/quarter X ~$1.00 ($0.32 for stamp, and $0.68 for envelope, paper and handling) = $150.00
OB Calculation 2: Time spent in PacifiCare of informing the Customer Service Dept. of a pregnancy at about 1 minute per notification, and about 100 pregnancies/month, with about 50 of those with no physician selection. Result is ~1 hours of savings per month not counting interruptions. 3 hours/quarter @ $16.45 average salary = $49/quarter

F. Savings from the ability to "cut and paste" instead of having to retype answers into the CSS report.

Customer concerns and complaints are called into PacifiCare. These are logged into a centralized computer database that allows the company to track these complaints by both the patient and by the facility or individual the complaint or concern has been logged against. These issues have to be addressed on a daily basis, and their resolution is tracked in the system. Each issue is left "open" until a resolution is obtained. The "CSS log," is then generated at the close of each business day, which is a listing of the new complaints or concerns, and any updates to concerns that are already "open" in the system. With the implementation of the IMS MEDACOM system, this log was generated and sorted by medical group, and then transmitted via IMS MEDACOM to each individual concerned location. (See savings in "A" above). The response from the groups, which also has to be logged back into the system can now be transmitted back to PacifiCare. Rather than transcribing a phone conversation, or retyping a written response into the system, the answer can simply be taken directly from the electronic response. The cost savings from not retyping are immense. The accuracy at time of comparison by such organizations like NCQA is of course 100%, since it is the same response.
Savings Calculation: 3 individuals X 13 weeks/qtr. X 2 hours/ day. X $11.60 = $4,176.00 per quarter.

G. Time saving due to "forced" clean copy of authorization with OB-GYN surgeries and other inpatient authorization. Due to the nature of the report, it requires information be filled into the "required or essential" fields. Approximately every third report used to require a phone call back. Now if any essential information not present, it can not be sent. Estimated time savings 15-30 minutes per day. (Average 20 minutes per day.) Savings Calculation: 1 individuals X 13 weeks/qtr. X 0.34 hours/ day. X $11.60 = $236.00 per quarter

H: Utilization Report Cost Savings calculation:

In June, 1996, the Health Data Analysts presented a Utilization Management (UM) Report format that required the input of FOCUS Report data (from the Claims database) and AU441 report data into an EXCEL worksheet. The report requires the following procedures by the Health Services Staff-

1 . Enter data on six spreadsheets for 35 UM monitors for each medical group. There are a total of 144 reports (6 spreadsheets per medical group x 24 medical groups). The Focus report is over 100 pages long. Information for the current month and the previous nine

months has to be updated from the FOCUS report every month as claims tables are updated.

2. Go into the Summary Pages (Com & SH) for each medical group and make the following changes on the 48 Summary pages: (a) Update the month of the report. (b) Change the settings for 56 formulas per summary to update them to pick up the current 3 months information from the spreadsheets. (c) Copy and paste the calculated fields as 'value only' in order for the graphs to pick up the information only and not the formulas.
3. Update the formulas for each category graphed (a total of 336 graphs--14 graphs for each medical group, 7 for Commercial & 7 for Secure Horizons x 24 groups)(31 categories total per medical group) to include the current month which totals 744 total formula changes for all the medical groups.
4. Change the print settings to include printing the current month and/or changing the title to the current month, a total of 216 setting's updates for all the medical groups.

Data entry, formula updates, print setting changes, and printing the reports takes 1.5 to 2 hours minimum per report. There are 2 reports per group (Secure and Commercial) and 24 medical groups, 2 hours x 48 reports and the total hours required to do this job is 96 x 10. 15 (average wage = $11,692.80 per year).

The entire secretary support staff spends several days each month to complete this task in a timely manner.

The electronic transmission of the AU441 report across IMS MEDACOM in a consistent fashion (data fields always in the same location), allows the analyst to "cut and paste" the data into a copy of the spreadsheet from the previous month, and eliminates 87.5 % of the data entry steps. The spreadsheet automatically recalculates and re-graphs the data. Net savings for the year =: 87.5% * $11,692 = $10,231. Net savings for one quarter is $2,557.

I. The electronic transmission of the AU441 report across IMS MEDACOM also allows for another individual who used to receive it on a weekly basis in a printed format, to now receive it in electronic format. We stopped the needless weekly printing of a large report that uses on average, one full box of paper (10 reams @~$2.68/ream) Savings due to paper conservation alone amount to $348/quarter.

J. The electronic transmission of some of what are called "focus" reports of data to several of the groups has resulted in savings any mailing and disk costs, and has allowed "real-time" transmission of data. These reports are not yet going to all the groups, and are done on a monthly basis. We have saved an average of two disks per group, the mailing costs for this and sent the data the same day as it was extracted from the system. Total savings for 3 groups each month with 2 disks (about $1.00) and the mailing cost of about $1.50 (envelope and postage) Total 3 groups X ($1.00 +1.50) X 3 times per quarter = $23/ quarter.

Table 7

Summary of PacifiCare Potential Personnel Cost Savings Through IMS MEDACOM Use

Case #	# of Persons	# Activity Days/ Quarter	Time / Day	Salary/ Hour	Cost Efficiencies[A]
A.	1	60	3.0 hours	$11.60	$2088.00
B.	3	60	0.25 hours	$11.60	$ 522.00
C.	1	3	1 hour	$11.60	$ 35.00
D.	1	26	0.34 hours	$11.60	$ 103.00
E.	1	3	1 hours	$16.45	$ 50.00
F.	3	60	2 hours	$11.60	$4176.00
G.	1	60	0.34 hours	$11.60	$ 236.00
H.	4	9	7.0 hours	$10.15	$2558.00
Total					$9767.00 (per quarter)

Table 8

Summary of PacifiCare Disk/Paper/Mailing Cost Savings Through IMS MEDACOM Use

Case #	# reams of paper	# Activities / Quarter	Stamps/ Handling	Paper Cost	Cost Efficiencies[B]
I.	10	13	N/A	$2.68	$348.00
E.	N/A	150	$1.00	N/A	$150.00
J.	N/A	9	$1.50	$1.00 (2 disks)	$ 23.00
Total					$521.00 (per quarter)

[A] These may not match text exactly due to rounding errors.
[B] These may not match text exactly due to rounding errors.

Conclusions

The benefits component of any IT project should be looked at in terms of a quantifiable component and a strategic component. A quantifiable component is defined as any hard savings, efficiency gains, or volume tolerance that you can identify through electronic system implementation. A strategic component suggests soft gains such as increase in market share and physician loyalty that you generate through the implementation. In this particular scenario, there were few if any hard savings other than paper and a not insignificant number of 3.5 inch disks. The efficiency savings calculated in this project are actually not money saved since no one was laid off. Instead of spending time on any of the projects mentioned, the individuals were able to redirect their time into other projects. This is in fact a cost avoidance. Converting an efficiency savings to a hard savings would actually require eliminating a position. However, efficiency savings are still valuable. Increasing efficiency allows you the luxury of not hiring additional personnel as the volume of work increases with company growth. Efficiency savings plus the "hard" paper and disk cost savings (these are real dollars, since the paper and disks were not used), added up to over $10,000 per quarter. These savings are not just a one time savings but will continue each quarter that the software is used. The return on investment (ROI) is approximately 22.4% ($10,287 / $46,000).

The behavioral change of getting individuals to use a new system is a big hurdle. The results at PacifiCare appear to be mixed. There are individuals who use the system frequently. There are individuals who see it as another source of more work and would be just as happy if the new software disappeared from their computer monitor altogether. It is very encouraging that

no user of the software considers it hard to use.[C] Attaching spreadsheets and other files to send electronically is simple. The email function, which is what the majority of the people at PacifiCare use the system for, is similar to PacifiCare's current system Microsoft Mail® product used both here in San Antonio and corporate-wide. This has made any training time requirement minimal.

The inability to integrate the IMS MEDACOM software into the referral patterns of the physicians' offices has been a source of continual frustration and is one of the reasons holding up the current evaluation of the software. Although this was one of the early expectations for the software, it is still a project "in progress". The use of proprietary office management software requires two separate companies to agree that cooperation is mutually beneficial. That process has slowly been coming to fruition, and may yet result in an integrated software product!

This implementation slowdown has not stopped the informal polling of individuals at several of the physicians' offices and MSOs. Of those contacted, 100% (n=10) agree that the other software functionalities such as email, eligibility listings, and the ability to receive and read the automated reports, are reliable, are easy to use, and allows them to send information electronically that used to be sent back and forth through the mail. This ability to stop the mailing of disks of information back and forth from PacifiCare to several of the sites also saves money and time. The additional function that this eliminates is the "re-keying" of any data that used to be sent in paper format only. Information can be inserted electronically and with 100% transfer accuracy into spreadsheets or other programs.

[C] Personal observation, and individual survey of 55 total work stations installed inside the PacifiCare San Antonio Market location and the Regional Customer Service Center.

Several of the hospitals in the immediate area have now begun to send electronic claims inquiries to the PacifiCare offices, thus decreasing the amount of time both groups have to spend on the phone. However, this does provide another source of inquiries that the PacifiCare customer service area must respond to. This "change of workload location" has required a behavioral change to believe that an electronic inquiry is just as important as a phone call or written request, and is due a similar or more expeditious response.

Opportunities

There are at least two challenges of implementing any software package that will almost always arise immediately after you install the software. The first challenge is that the competition may have other functionalities or have the capability to perform some electronic "wizardry" that you are unable to do. The second challenge is that no matter what package of capabilities are installed, there will always be someone who comments: "That's great, but it would be nice if we could do _____. . .. (Substitute whatever you want to here).

This is exactly the case in installing IMS MEDACOM software at PacifiCare. At least one of the competing HMOs that also use the IMS MEDACOM vendor has some electronic capabilities that seem to put PacifiCare at somewhat of an electronic disadvantage. As one example, the other HMO has an automated patient eligibility response unit connected to the system. This allows the other HMO to electronically transmit electronic responses to patient eligibility inquiries across IMS MEDACOM without any requirement for human intervention. PacifiCare will have to see if they can "match" this response time to queries about eligibility. A similar issue exists on automated responses to queries on the status of the processing of a claim.

They have it, and PacifiCare does not. The result is that the other HMO has a response time of approximately minutes to one hour vs. days for the PacifiCare manual response. These two areas need to be evaluated to see if a relatively easy "fix" can be fabricated. The company is already discussing some possible options to remedy this apparent "shortcoming." Hopefully a solution can be worked out that will allow "real time" responses to this type of inquiries, and thus put PacifiCare at parity with the other HMO.

The myriad of different health care provider organizations also results in each of the areas having their agenda on which they wish to focus. The MSOs like the authorization data PacifiCare is now sending them, but wish to also receive capitation reports. PacifiCare has not yet worked out how they can transmit these electronically. As mentioned before, the primary care physicians want to be able to send referrals electronically from their office management software across IMS MEDACOM. IMS MEDACOM is still working on trying to arrange this. The specialists want to be able to check patient eligibility to insure payments for those same referrals. This also is being looked at from an automation standpoint. However, a simple "non-electronic" fix would be for the primary care groups and PacifiCare to guarantee payment for any referrals generated. It is unclear that PacifiCare and the PCP groups are ready to take that interesting step. To say the least, there is enough work to keep IMS MEDACOM and PacifiCare busy for quite a while in addressing the wants and desires of all these different partners.

Discussion

It has been said that "Information is the central and indispensable tool of practice."[33] Twelve years later this statement is probably even more absolute. Managed care has transformed

the landscape of medicine. The explosion of knowledge that increases medical information at an exponential rate shows no sign of abating. For different reasons, both of these areas mandate the use of a sophisticated HIN to help provide improved quality in patient care. Managed care organization (MCOs) continue to look for cost savings through the use of the most efficient methods of treating patients. Physicians are looking to information databases to find the most effective and current medical means to care for their patients. They are also investing more efforts in disease prevention rather than intervention, and are looking for good data to support clinical guidelines.

MCOs are slowly realizing that providing physicians with accurate and timely data management tools makes good business sense. It will take some significant time, money, and effort to achieve the level of sophistication that everyone desires. However, failing to develop simple effective prototypes will leave with the current unacceptable level of sophistication.

Successful resolution of the knowledge-management and fiscal control problems most physicians and healthcare executives face depends on a shift away from personal responsibility for managing a myriad of external knowledge resources. Instead, there is a movement towards organizational responsibility for maintaining and distributing information. All health care executives, and especially physicians and other health care providers, whether they are employees of large organizations or not, must be involved in the development of and the use of such tools. Such a shift in emphasis is slowly coming about and is largely being fueled by advances in technology related to the Internet and organizational intranets as described here.

The Military Health Service System (MHSS), as one of the major healthcare organizations in the United States, also needs to get involved and interested in the

standardization of data transfer, especially in the sharing of healthcare data among medical facilities. The implementation of TriCare in the MHSS has resulted in an increased reliance on civilian healthcare facilities to provide certain services to some categories of beneficiaries. This reliance upon civilian facilities and the sharing of different capabilities to reduce expensive duplication means patients may receive care at multiple different sites. If a patient is referred to a "Center of Excellence" -- a facility that provides the "best" of a particular kind of health care -- it is critical for data to be available about that specific patient to all members of the healthcare team, whether they are civilian or military. Baseline patient data must be available to all care centers, and the results of care at any location must be made available quickly and efficiently to the referring facility.

The government has become involved in an oversight role to develop standards for information transfer. The Kennedy Kassebaum Law mandated that standards for healthcare information transfer be developed. Recognizing that Congress is not the subject matter expert in the field, the law has instead handed the standards recommendation and implementation off to the organizations that have to "live with" the criteria that are eventually developed. These standards will improve the seamless transfer of information astronomically. The goal of having the right information available in an understandable format when the clinician or other manager of health needs it, is closer to reality, and is not just the vision of some information management "wizards." Equally valuable, the information on healthcare utilization will be easier to use, and to evaluate for effectiveness. We are coming closer and closer to utilization and evaluation of evidence-based interventional medical data, and will not have to settle for a limited number of manual chart audits due to the cost and time limitations that a manual process entails. The

emphasis on cost savings, increased efficiency, and patient satisfaction with our medical care system, is propelling the move to electronic billing, authorization for services, referrals, and claims management as integrated pieces of the health care picture. These are all coming more sharply into focus, and the organizations that use and improve on these types of electronic systems will have a decided advantage in the health care industry of the future.

Final Comments

PacifiCare has taken one of many steps that will be required to bring the company closer to an integrated delivery system. The IMS MEDACOM project has definitely resulted in improved information transfer to and from PacifiCare partners. While the ROI for the IMS MEDACOM project is not the 30-50% projected (the current industry standard for areas with some automation already implemented),[9] it has done at least as well in the quantitative analysis as most of the organizations that have implemented this type of project. The more qualitative aspect: that of ease of use of the software and stability of the product, have scored 100%, both at PacifiCare and the other user locations. As discussed previously, the other less quantifiable things like physician loyalty and the improvement in the PacifiCare partners' ability to productively manage the shared information are difficult to put a dollar figure against. The concept that PacifiCare is willing to share their data with other companies and with individual providers promotes a sense of trust and cooperation. This good will is difficult to quantify, but means quite a bit in any business relationship.

This project appears to be a win-win, and should be considered for implementation at other locations in other cities. The first step would be to "fix" the concerns of the current users

by providing the capabilities they desire. The second step would be to continue to expand the "reach" of the intranet network to match up with the regional capabilities being developed at the Regional Customer Service Center located in San Antonio, which serves the entire Southwest region. Since the vendor for this intranet system also has offices in Dallas, and Houston, the initial steps to expand the electronic network should be fairly straightforward. Only sitting down and working out a strategic implementation plan is required to start the overall process.

Appendix A: Basic Information on PacifiCare[34]

PacifiCare of Texas is an HMO subsidiary of PacifiCare Health Systems, Inc. (PHS), a California based holding Company. Besides PacifiCare of Texas, the parent organization owns and operates located in 15 states, and in Guam after the recent acquisition of FHP. PHS manages the HMO's regionally, although they all have access to the parent organization's expertise.

PHS is now the fifth largest managed health care service company in the United States. It is a publicly traded holding company whose various subsidiaries offer an array of managed care products and services, including traditional HMO products, dental and vision services, life insurance, workers compensation, a pharmacy benefit management program, and behavioral health programs. Activities of the company have been concentrated in the medium and large group markets. However, with saturation of business in the California market, PHS has begun soliciting the small group and individual markets.

PHS operates three major business segments: (1) Commercial, (2) Medicare, and (3) Medicaid. The first two segments are much more mature markets for PacifiCare where the combined HMOs have approximately 69% and 28% of membership, respectively.

Operations of the Texas plan differ from the California operation as the Texas plan is a combination group practice / IPA HMO. The HMO started operations in San Antonio in 1986 and is currently the largest HMO in that market. The company has expanded beyond San Antonio, having entered the Houston market in 1994 and Dallas in 1995. In San Antonio, most of the HMO's medical services are provided through primary care medical groups, as opposed to Houston and Dallas where the HMO has contracted directly with physician groups.

Enrollment growth in Texas has been strong, especially in the San Antonio market. Commercial membership in the San Antonio area exceeded 60,000 members in calendar year 1995, while Medicare risk enrollment was over 28,000. PacifiCare is also building market share in the Houston and Dallas areas.

PacifiCare's Medicare risk product has shown good growth in Texas, with total Medicare enrollment of over 52,000 members prior to the acquisition of FHP. PacifiCare is the largest Medicare risk HMO in the state.

Appendix B: Demo Letter to Physicians

Date

Dr. xxxxx.
Provider Office Name
Street Address
San Antonio, TX , zip code

Dear Dr. xxxxx:

PacifiCare is contracting with Integrated Medical Systems, Inc. to improve healthcare communications. IMS, a healthcare communications company, through its MEDACOM Network, links physicians, health plans, hospitals, laboratories, etc., together electronically.

We at PacifiCare cordially invite you to participate in the pilot phase of our electronic communications network. **There is no charge to the physician or medical group for using the IMS MEDACOM Network.** Rather, PacifiCare is sponsoring your participation.

The goal of this Network is to enhance the efficiency and effectiveness of healthcare communications among primary care physicians, specialists, hospitals, managed care organizations, and thus improve patient care. Since the Network is focused on improving our ability to streamline communication, it is very important that physicians such as yourself advise us during the pilot phase of our implementation.

The pilot phase is expected to last approximately 2 - 3 weeks. During this time, your office will be asked to review reports that you will receive from hospitals (Santa Rosa Healthcare System) and/or PacifiCare, check the format of the reports, and determine if all designated reports/message transmissions arrive as expected. In addition, you will also be given the opportunity to test the Scripts (screen formats), to see if they are user friendly and provide the information that you feel is necessary, etc. Your active participation in this area will not only help us to provide you with useful information, but will also expose you to the full range of capabilities that PacifiCare's IMS MEDACOM Network can provide.

Some of the specific features and benefits of the Network to physician practices include:

- **Access to patient eligibility information.** You will receive current patient eligibility information on a daily basis to your computer.

- **Electronic Referral transmission.** For those primary care physicians or medical groups that utilize Reynolds & Reynolds as their practice management system, MEDACOM will be able to capture the referral and automatically transmit it to participating specialist physicians.

- **Physician-to-physician and other communications.** You and your staff could eliminate frustrating "telephone" tag by communicating with other participating physicians for patient referrals and consultations; PacifiCare departments for inquiries and information; and other participating healthcare firms.

Use of the Network would require that your office have an appropriately configured IBM compatible personal computer, a modem and phone line. Your computer can be used for other activities - the Network runs in the background and will not interfere with other software you may be using.

PacifiCare will be holding informational meetings about this Network at our offices at 8200 IH-10 West, Suite 1000, at the following times:

- **Wednesday, date, 1996 at 12 Noon (Hemisphere room - lunch served)**; and

- **Thursday, date, 1996 at 8:00 a.m. (Hemisphere room - breakfast served)**

The meeting will last approximately 1 hour, during which time you will:

- become familiar with the capabilities of the Network
- see a live demonstration of the software
- discuss the expectations of the pilot phase, and
- receive information on the services and support provided by IMS MEDACOM

Please call xxxxxx, PacifiCare's Network Coordinator, at xxx-xxxx to confirm your attendance on either date, or to make other arrangements to learn about the Network if you are unable to attend.

We believe that the Network may have a very positive impact on improving the delivery of patient care, and we look forward to your feedback about this important healthcare communications initiative.

Very truly yours,

xxxxx
Director, Delivery Systems Performance

xxxxx
Director, Customer Service

Appendix C: Practice Profile/Pre-Installation Survey

How satisfied are you with the current information flow processes with PacifiCare?

Not at all Somewhat Satisfied Very Extremely

Eligibility

What process do you use today to verify eligibility?

Voice Response Unit Customer Support Other (please specify)

_____

How satisfied are you with PacifiCare's eligibility process?

Not at all Somewhat Satisfied Very Extremely

Referrals (Primary Care Providers only)

How are PacifiCare referrals initiated today?

Hand Written Computer Word Processor Office Automation System (like R&R)

What is the approximate number of referrals generated each month? Number: _____

How long does the referral process take today?

1 min. 2 min. 3 min. 4 min. 5 min. other_____ (time)

What materials are used today to process a referral?

	copier	fax machine	envelopes	postage	computer	other (specify)
Number of times						

Claim Status Inquiry

How do you process a claim status inquiry today?

	copier	fax machine	envelopes	postage	computer	other (specify)
Number of times						

What is the approximate number of claims status inquiries generated each month?

Number_____

How long does it take to submit each claim status inquiry today?

1 min. 2 min. 3 min. 4 min. 5 min. other_____ (amount)

What is the average response time for a claim status inquiry?

<30 min. 30 min. - 1 hr 1 hr - 4 hr 4 hr - 8 hr other_____(number)

How satisfied are you with the claim status inquiry process?

Not at all Somewhat Satisfied Very Extremely

Authorizations

How do you process an authorization request today?

	copier	fax machine	envelopes	postage	computer	other (specify)
Number of times						

What is the approximate number of authorization requests generated each month?

Number: _____

How satisfied are you with the transfer and coordination of authorizations with PacifiCare?

Not at all Somewhat Satisfied Very Extremely

How much time is spent per day working with PacifiCare's personnel on authorizations?

<30 min. 30 min. - 1 hr 1 hr - 4 hr Other_____

Provider Communication

How do you communicate with other providers today?

Phone Mail Fax Other (please specify) _____

How satisfied are you with communications among providers today?

Not at all Somewhat Satisfied Very Extremely

Follow up Survey

How satisfied are you with the current information flow processes with PacifiCare?

Not at all Somewhat Satisfied Very Extremely

How would you rate the process of checking eligibility on IMS?

Not at all Somewhat Satisfied Very Extremely

What is the approximate number of referrals generated each month? Number: _____

What materials are used today to process a referral?

	copier	fax machine	envelopes	postage	computer	other (specify)
Number of times						

(This should add up to approximately the number of referrals listed above.)

How long does the referral process take today?

1 min. 2 min. 3 min. 4 min. 5 min.

How would you rate your satisfaction with referral process using IMS?

Not at all Somewhat Satisfied Very Extremely

Claim Status Inquiry

How satisfied are you with the claims status inquiry process using IMS?

Not at all Somewhat Satisfied Very Extremely

How do you process a claim status inquiry today?

	copier	fax machine	envelopes	postage	computer	other (specify)
Number of times						

What is the average response time for a claim status inquiry?

<30 min. 30 min. - 1 hr 1 hr - 4 hr 4 hr - 8 hr > 8 hr

If you receive membership listings across IMS, how pleased are you with the process?

Not at all Somewhat Satisfied Very Extremely

Authorizations

How satisfied are you with the coordination of PacifiCare's authorization process?

Not at all Somewhat Satisfied Very Extremely

How do you process an authorization request today?

	copier	fax machine	envelopes	postage	computer	other (specify)
Number of times						

What is the approximate number of authorization requests generated each month?

Number: _____

How satisfied are you with the transfer and coordination of authorizations with PacifiCare?

Not at all Somewhat Satisfied Very Extremely

How much time is spent per day working with PacifiCare's personnel on authorizations?

<30 min. 30 min. - 1 hr 1 hr - 4 hr Other_____

General Communication

To what extent has IMS helped to improve your overall communications with PacifiCare?

Not at all Somewhat Satisfied Very Extremely

How satisfied are you with the support provided by IMS?

Not at all Somewhat Satisfied Very Extremely

Provider Communication

How do you communicate with other providers today?

Phone Mail Fax Other (please specify) _____

How satisfied are you with communications among providers today?

Not at all Somewhat Satisfied Very Extremely

Appendix D: General Computer Terms[35]

- **ANSI**

American National Standards Institute. An organization that develops computer-related standards that are commonly used as guidelines in the industry.

- **ASCII**

American Standard Code for Information Interchange. A standardized 8-bit code used to represent characters (letters & numbers). A universal exchange format for character-based information.

- **AppleTalk**

The software protocol for Apple's LocalTalk networks.

- **Application Program**

(Application, Program)

A program designed to provide a specific type of function for the user.

- **Assembly Language**

(Assembly, Assembler.)

A low-level, machine-oriented programming language. Typically used to create very small, very fast applications or system software.

- **Audit Trail**

A record of all the events relating to a transaction, from initial entries through final report. Computerized audit trails are generally used for system audits or reconstruction of lost transactions.

- **BASIC**

Beginner's All-purpose Symbolic Instruction Code. An early computer language designed to be easy to learn & program. BASIC lives on in several different versions including the widely used VISUAL BASIC.

- **Backup**

1) A preserved copy of original data or processed information as a safeguard against accidental destruction or alteration. 2) The process of creating such a backup copy. 3) Any resource needed for disaster recovery.

- **Batch Processing**

A processing method in which items are first individually entered and then processed as a group.

- **Baud**

(Baud Rate.)

A measure of the speed of data flow usually expressed as bits per second (BPS).

- **Bit**

Binary digit. The basic unit of digital information, a single 0 or 1 in binary notation. See Also: Byte, Character.

- **Bug**

A defect or error in computer hardware or software. Legend has it that this term was coined when a major computer malfunction was traced to a moth in the hardware.

- **Bulletin Board System**

(BBS.)

A computerized service that can be accessed by modem. BBS's provide a variety of services such as messaging, conferences, software libraries, etc.

- **Bus**

(Path)

Multiple, parallel circuits used to transmit data. Usually refers to interconnections between various hardware components such as the CPU, Memory, Video Display, etc.

- **Byte**

A sequence of adjacent bits (usually 8 bits) taken as a group. Typically equivalent to one character.

- **CD-ROM**

Compact Disk - Read Only Memory. A mass storage device based on compact disk technology. CD-ROM's are read-only devices that can store enormous amounts of data with a very high level of reliability and longevity.

- **CISC**

Complex Instruction Set Computing. A CPU that is designed to perform many different complex instructions. The basic technology of the x86 and 68K series of processors. See also: RISC.

- **CPU**

See Central Processing Unit.

- **CRT**

See Monitor.

- **Canned Software**

Prepackaged, off-the-shelf application programs (as opposed to customized applications).

- **Central Processing Unit**

(CPU; Processor.)

The computer inside the computer. The CPU contains the circuits that execute a program's instructions.

- **Character**

A single symbol such as a letter, digit or punctuation mark. Usually represented by one byte (8 bits).

- **CHIN**

(Community Heath Information Network)

An electronic information access system/database that acts as a storage and communication facilitator, allowing information to be shared on patient clinical information and coverage status, financial accountability and current treatment. There are various forms, with complete and incomplete variations through the healthcare system at large. (See Appendix ,E and also related: HIN) Major difference between CHIN and HIN is the centralized (shared) database usually seen with a CHIN, and not seen in a HIN.

- **Chip**

(Integrated Circuit, IC)These chips typically consist of thousands or millions of microscopic electrical circuits on a wafer-thin slice of silicon. They are the basis of the digital age. The CPU represents the ultimate chip.

- **Computer Language**

(Programming Language; Language.)

A language that is used to create a program for a computer. Like human language, computer languages come in a variety of dialects, each with its own set of characters, symbols, and grammar.

- **Crash**

(Bomb, Die.)

A breakdown or failure in software or hardware.

- **Cursor**

1. A moving marker (such a flashing line or rectangle) on a video screen which indicates where data may be entered or a correction made.
2. A marker (often an arrow) which moves on a video screen as the user moves a mouse or trackball and is used to select items or actions.

- **DOS**

Disk Operating System. One of the original system software packages and the base operating system for most IBM PC compatibles. DOS comes in a variety of flavors, the most popular of which is Microsoft DOS. See Also: Operating System.

- **DX**

Refers to a double width internal data path for the x86CPU family. DX CPU's use a true 32-bit data path. See Also: SX.

- **Data**

A single value or group of values.

- **Database**

(Data Base, DB.)

1) A collection of data organized to facilitate retrieval, searching, and analysis. 2) The program(s) used to create and manipulate a collection of data.

- **Debugging**

(Bug-busting, etc.)

The process of detecting and correcting errors in computer hardware or software.

- **Disk Drive**

An electromechanical device used to store large amounts of data. Various types of media and techniques are used such as floppy disks, hard disks, and optical disks.

- **Diskette**

(Disk, Floppy Disk, Microdisk)

Media used to store data and programs. Typically a small magnetic disk made of flexible Mylar material enclosed in a protective shell.

- **Distributed Data Processing**

A technique that uses multiple, tightly coordinated computers often in widespread locations to process large volumes of data or carry out complex operations.

- **Documentation**

(Manual, Users Guide, Reference.)

All documents, manuals, etc., that come with a computer system.

- **Dots Per Inch**

(DPI)

A measure of visual clarity for both monitors and printers. The higher the density of dots per inch, the clearer the image. DPI range from 72 for the average monitor to 300 or 600 for a typical laser printer.

- **Download**

To copy data or programs from one computer system or BBS to another.

- **Downtime**

(Down, System Downtime.)
Loss of use of a computer system due to breakdown, malfunction, repair time, or scheduled maintenance.

- **E-Mail**

(e-mail.)

Electronic Mail. 1. A combination of hardware and software that allows the sending and receiving of data (typically messages) from one computer system or user to another. 2. The information sent or received by such a system.

- **Edit**

To format data or make changes in **a** file.

- **EtherTalk**

The software protocol for the Ethernet networking method. See also: Ethernet.

- **Ethernet**

A networking protocol. This widely used protocol is very fast and relatively inexpensive.

- **Expansion Slot**

A slot or space built-in to the computer for plugging in printed circuit cards. These cards typically provide new hardware functions such as a modem or special monitor.

- **FTP**

File Transfer Protocol. A set of rules (protocols) used to transfer a file from one computer to another. Typically used to move files around the Internet.

- **Fax Modem**

A modem that also doubles as a send/receive facsimile. This device allows the user to directly
send/receive a fax document to/from the computer.

- **Field**

A portion of a larger record containing a single unit
of information. Often refers to data items on the
screen or in a database.

- **File**

(Document)

A grouping of related data typically stored on a disk. A file can contain data, programs, or both, and is identified by a file name.

- **File Server**

(Server.)

A computer, linked to a network, which is dedicated to providing file services to all users on that network. Often contains shared data or application programs.

- **Firmware**

(ROM, PROM, EPROM.)

A hardware and software hybrid created by "hard wiring" a program (software) into hardware. Usually refers to ROM or related types of memory.

- **Floating Point Unit**

(FPU, Math Coprocessor.)

A specialized processing unit designed to quickly handle floating point mathematics. Floating point numbers are very large or very small numbers.

- **Floppy Disk**

See diskette.

- **Font**

A Typeface. There are literally thousands of different fonts available for computers.

- **Fortran**

FORmula TRANslation, an early computer language designed for scientific and mathematical use. Only in limited use today.

- **GIGO**

Garbage In, Garbage Out. The principle that putting in faulty data will lead to faulty analysis or results.

- **GUI**

Graphical User Interface. Computer software that makes extensive use of pictures, graphics, icons, menus, and windows to interact with the user.

- **Giga**

One billion.

- **Hard Copy**

A printed copy of computer output.

- **Hard Drive**

See Disk Drive.

- **Hardware**

Physical components of a computer and related peripheral devices.

- **HIN**

(Health Information Network)

1. Defined in part by the originators, nearly all HINs support basic communications such as e-mail and transmission of demographics. With managed care as the driver, most HINs are developing functionality to support claims submissions, inquiry and status, eligibility, referral and pre-admit authorizations, and enrollment and benefits data.

2. An integrated collection of computer and telecommunication capabilities that facilitate the exchange of patient, clinical and financial information among physicians, hospitals, payers, employers, pharmacies and related health care entities within a geographical region.[36]

- **Hertz**

(Hz., CPS, Clock Speed, Clock Cycles.)

Cycles Per Second. Most CPU's operate by decoding and executing one instruction at a time. Each of these operations roughly corresponds to a single "cycle". Therefore, computers can be speed rated based on the number of operations or cycles they can perform per second. Usually expressed as Megahertz (millions of cycles per second). See Also: Mega.

- **High-level Language**

(3rd or 4th Generation Language, 3GL, 4GL.)

A more advanced computer programming language that simplifies the programming of different types of computers. High-level languages have gone through several generations with the latest being the 4th generation languages or 4GL.

- **HTML**

HyperText Markup Language. A special programming language used to create documents on the Internet and WWW

- **Icon**

A pictograph. Often used in GUI to give pictorial hints about an object's functions.

- **Input**

(Enter, Entry, Data Entry.)

1 - The act of entering information into a computer. 2. The information entered into a computer.

- **Interface**

A connection between two devices, systems, or processes or between a computer system and the user.

- **Internet**

(The Net, Information Superhighway, Infobahn.)

1. Any connection between two independent networks. 2. The large conglomerate of commercial, educational, and government computers which are all interconnected.

- **Keyboard**

A computer peripheral that allows the entry of character data into a computer.

Kilo (K.)

One thousand. Because computers use binary notation (base 2), 1 K equals 1,024 which is the nearest power of 2 to 1,000.

- **LAN**

Local Area Network. A network that is limited to a small geographical area, usually one building or one floor of a building.

- **LCD**

Liquid Crystal Display. A display technology used in most portable computers. LCD panels are lightweight and very thin.

- **LPM**

Lines per minute. The output speed of a line printer.

- **LocalTalk**

Apple's networking protocol. LocalTalk is a simple and inexpensive networking architecture. See Also: EtherTalk, Ethernet, AppleTalk, Network-

- **Machine Language**

The lowest level of computer programming, it uses instructions that can be read and used directly by the computer without further processing or translation. See also: Assembly Language.

- **Macintosh**

(Mac, Apple Mac.)

Brand name for one of the first commercially successful GUI computers originally produced by Apple Computer. This term now applies to an entire line of computers.

- **Mainframe**

(Big Iron.)

The largest computers by relative price, size, speed of execution, and computing power.

- **Mass Storage**

A peripheral device for storing and retrieving programs or large amounts of data. Examples include magnetic tape, disks, CD-ROM, optical media.

- **Mega**

(M)

One Million.

- **Memory**

(RAM, ROM.)

Hardware that can store and retrieve data or programs. Usually built-in to the main computer.

- **Menu**

A list of options from which the user may select. A basic element of GUI programs.

- **Microcomputer**

(Personal Computer, PC.)

The smallest computers such as Desktop personal computers. See also mainframe & minicomputer.

- **Minicomputer**

(Mini.)

A midrange computer that is more powerful than a microcomputer but less powerful than a mainframe.

- **Modem**

MOdulator DEModulator. A device that connects a computer to standard telephone lines and facilitates transmission of data.

- **Monitor**

(Tube. CRT, Screen.)

An electronic vacuum tube in which a beam of electrons is used to produce a visible display on a video screen.

- **Mouse**

An input device that controls the movement of a cursor on the computer monitor. Usually has one or more buttons that can be used to select various actions.

- **Multimedia**

The combined use of text sound, pictures, video, or other communications media. Multimedia can refer to hardware, software, or both.

- **Multiprocessing**

A method that uses multiple computers or CPUs in a highly coordinated fashion to produce a very fast, powerful system.

- **Multitasking**

Running more than one program or application at the same.

- **Nano**

One billionth.

- **Network**

A collection of computers, printers and related devices that are interconnected, usually by cable. The interconnections facilitate the transmission of data from one device (or node) to another.

- **Novell**

Novell, Inc. A company that produces one the most widely used networking protocols - Novell Netware.

- **OCR**

Optical Character Recognition. A technology that can read text on paper documents and convert it to computer text (ASCII). Typically used with a scanner to input documents to a word processor or similar program..

- **Off Line**

Not connected to the computer system.

- **On Line**

Connected to the computer system.

- **Operating System**

(OS, System Software.)

The basic or core software of any computer system. The OS handles such tasks as loading and running application programs and file management.

- **Output**

1. The process of producing information from a computer.
2. The information produced by the computer.

- **PCI**

Peripheral Component Interface. A standard data bus (or channel) used to connect the main CPU with peripheral components such as video monitors and hard disks.

- **PCMCIA**

Personal Computer Memory Card International Association. A hardware protocol designed for use with small cards or modules which plug into a small slot on a computer. Typical PCMCIA devices include modems, memory expansion, and hard disks.

PDA

(Palmtop.)

Personal Digital Assistant. A hand-held computer. Most use a pen and handwriting recognition for input.

- **PREP**

PowerPC Reference Platform. A relatively new hardware standard that is designed to allow operating systems from different vendors to run on any PowerPC.

- **Password**

A unique and confidential sequence of characters used by an individual to gain access to a computer system or program.

- **Pentium**

(686, P5.)

The latest in the x86 series of CPU's produced by Intel Corporation. Pentium is the brand name for the 586 CPU.

- **Peripheral Device**

(Peripheral.)

A physically separate hardware device for use with a computer. Examples include printers, disk drives, monitors, keyboards, a mouse, etc.

- **Plug and Play**

(PnP)

The, notion that you can simply plug in a new peripheral device and have it (and the computer) automatically configured and ready to use.

- **Power Supply, Uninterruptible (UPS.)**

A power supply that can detect power failures and use a battery backup system to provide continuous power to the computer. Often used in critical settings where a power failure would be disastrous.

- **PowerPC**

(PPC.)

The first of a new family of CPU's that uses RISC technology. The PowerPC is the result of a joint effort by IBM, Apple and Motorola.

- **Print Server**

A network based software system that is dedicated to providing printing services to all users on that network. Often based on a dedicated computer, a Print Server can manage multiple printing tasks very efficiently. See also Spooling, File Server.

- **Printer**

An electromechanical device that produces printed material.

- **Printer, Dot Matrix**

A printer that prints a character at a time using a configuration of dots. Generally less expense but produces lower quality output.

- **Printer, Laser**

A printer that prints a page at a time using a laser and heat-labile ink. Generally produces a very high quality hard copy.

- **Printer, Line**

A printer that prints an entire line at a time, usually at very high speeds.

- **Processor**

See Central Processing Unit.

- **Program**

(Application, Software, Code.)

A set of instructions that direct the computer to perform specific function.

- **Programming Language**

See computer language.

- **RAM**

Random Access Memory. Internal computer memory that is used to store and retrieve data and programs. The contents of RAM memory are lost when the computer is turned off (or loses power).

- **RISC**

Reduced Instruction Set Computing. An alternative design to CISC, RISC uses simpler instruction sets that run much faster. Examples include the new PowerPC.

- **ROM**

Read Only Memory. Internal computer memory that is used to permanently store data and programs for later retrieval. The contents of ROM memory are set at the factory and are NOT lost when the computer is turned off (or loses power).

- **Random Access Memory**

See RAM.

- **Read**

The act of copying data from one location to another. Usually refers to a transfer of data from a mass storage device such as a disk drive to the computer's main internal memory.

- **Read Only Memory**

See ROM.

- **Record**

A logical collection of related data items. A record typically consists of related fields in a database.

- **SCSI**

Small Computer System Interface. A standard interface used to connect peripherals such as hard disks or scanners to a computer.

- **SVGA**

Super Video Graphics Array (or Adapter). An extension of the VGA standard interface for connecting a video monitor.

- **SX**

Refers to a single width internal data path for the x86 CPU family. SX CPU's use a 16 bit data path rather than a true 32-bit data path. See Also: DX.

- **Scanner**

An electromechanical device designed to convert a printed image into a digitized computer document. Often used to enter pictures or large amounts of text from a printed page into a computer system.

- **Service Bureau**

A company that provides computer services, usually at site remote from the user.

- **Shareware**

An alternative form of distributing software in which users are asked to evaluate the software and to send in a fee only if they decide to use it. Typically the software is available for downloading from BBS's and the fees are much lower than conventional commercial software. There is an extremely large and diverse set of shareware available from many different sources.

- **Snail Mail**

(s-mail.)

Traditional mail services such as the US Postal Service.

- **Software**

See application programs, canned software.

- **Sorting**

The act of putting data items into a specific order.

- **Spooling**

Spooling is a technique in which input from or output to slower devices such as printers is placed into queues (a sort of waiting area) to await actual transmission. This technique allows the CPU to go on about its business without waiting for a slower peripheral.

- **System**

Computer hardware, software, and all related components.

- **System Analyst**

Someone who analyzes requirements and develops them into a conceptual framework of a computer system.

- **Terminal**

(CRT terminal, Dumb Terminal)
A computer input/output device consisting of a monitor and keyboard.

- **Trackball**

An input device that consists of a ball that sits in a cradle. When the ball is rotated a cursor moves on the screen. A sort of upside down mouse.

- **Turnkey System**

A complete computer system for which a single vendor assumes total responsibility for hardware and software construction, installation, and testing. In effect, the user simply "turns the- key" to startup a new computer system.

- **UNIX**

A widely used, command line based, operating system. UNIX comes in a wide variety of types.

- **URL**

Uniform Resource Locator. A standardized method for indicating an address on the internet.

- **VGA**

Video Graphics Array (or Adapter). One of the standard interfaces for connecting a video monitor.

- **Vaporware**

Promised software (or hardware) which never actually appears. Some vendors have a reputation for making promises they cannot keep.

- **WAN**

Wide Area Network. A network that covers a large geographical area and consists of multiple interconnected local area networks.

- **WWW**

(The Web.)

World Wide Web. A portion of the Internet.

- **WYSIWYG**

What You See Is What You Get. The idea that what is shown on the screen (monitor) will be exactly the same as the printed version.

- **Window**

A graphical user interface object that consists of a rectangular section on the screen. Often contains special controls for displaying information. A basic element of GUI programming and design.

- **Windows, Microsoft**

(MS Windows, Windows, Windows 95, Win95.)

A set of operating systems sold by Microsoft, Inc. MS Windows makes extensive use of GUI techniques and comes in a variety of versions.

- **x86 System**

A series of CISC processors designed by Intel Corporation and used extensively in IBM Compatible PCs.

Appendix E: Community Health Information Networks

Community Health Information Networks (CHINs) are the result of the driving forces of several diverse factors.

First and foremost, the evolution of information technology and recognition of its capabilities have revolutionized all industries. Where health care services have been held up, misdirected, bloated, or simply erroneous, they can now be redirected, informed, streamlined, and proven.

Second, political developments and changes have made streamlining the health care industry a priority. The demand for restructuring of healthcare has intensified due to the realization of the way that inflated costs of inefficient healthcare negatively affect productivity, financial resources, and subsequently, international competitiveness.

Last and most important, social determinants have engendered an atmosphere of accountability and responsibility on the part of all health care participants. This includes the employers, payers, workers and the government.

CHINs:

- Facilitate the communication among providers, payers, and related health care entities.
- Ease the administrative and bureaucratic burden borne by hospitals, payers, and their staff.
- Streamline the delivery of health care
- Collect, store, and provide analytical data on health care delivery, outcomes data, patient data and history, and clinical quality assessment.[21]

Level 1: Simple transactions

1. *Transaction switching and networking* is the technology capability that allows information from point A to point B. It involves sending, converting, accessing, and responding capabilities and includes translation, reconfiguration, and security features.
2. *Clinical communication* is a technical and more specific version of transaction switching and is the ability to move patient specific data among providers based on established parameters or specifications.
3. *Payer communication* is the ability to transmit or receive payer claims, referrals, claims status information, and other payer oriented data.
4. *User interface* is the system access method, such as graphical, menus, or screens.

Six basic categories of CHINs capabilities

- Health plan coverage verification (eligibility and benefits verification, referral submission, and health plan enrollment)

- Claims processing (includes demographics, claims submission, status checking)
- Payment processing (electronic fund transfers and payment card debiting)
- Clinical applications (primarily used in hospital transactions such as patient searches, and rounds lists, and well as medical records abstracts)
- Supply transactions (electronic purchase orders, receipts, and pricing updates)
- Messaging applications (facilitating communications both within and among organizations and includes standard e-mail, informal referrals and directories of participants in the network)

Level 2 Augmented transactions

- Data storage applications (databases developed to facilitate the sharing of data among CHIN participants
- Data analysis applications (databases developed to facilitate the analysis of subscribers' data to normative values)
- Data access applications (databases that allow access and review of information without the ability to update it or modify it)

Level 3 Interactive transactions

- Automation of existing process (usually paper based) and developing of a new impetus to generate new applications
- Network expansion to include intra- and intercommunity devices and connections
- Multiple clinical functions such as conversational quality radiographs

By giving health care providers, payers, and related entities access to health care data and other patient information, CHINs allow subscribers to transmit claims, clear payments, refer to past medical treatment, and review other administrative information. Clinical data can be moved and duplication of procedures eliminated. Because of these capabilities, CHINs have the potential to achieve enormous financial savings by cutting administrative costs and improving quality. Indeed, in enabling all components of the delivery system to provide seamless care, the capacity for financial, administrative, and qualitative improvement is significant.[21]

Appendix F: Fact Sheet Integrated Medical Systems, Inc. a subsidiary of Eli Lilly & Co.[2]

What does IMS do?

IMS electronically connects physicians to enterprise facilities, through a single desktop device and with a common interface.
IMS recruits, trains and supports practices in the use and configuration of their IMS MEDACOM workstations.
The physician desktop offers:
IMS' local database arranges captured information into patient folders
Connection to external networks and applications (can consolidate printers and terminals)
Practice Management System interface
Automatic Report Reception
E-Mail / Bulletin Board
Discharge Reports
Messaging
Orders
CME

Enhanced Integration Services

IMS connects physicians by embedding menu selections into the IMS software suite through existing network topology, interface engine, print stream or display capture, or direct connection to host systems for:

- **Hospitals**

  Clinical Systems- Automatic Result Delivery
  Financial Systems- Billing, Claims, etc.
  Administrative Systems- Orders, Scheduling, etc.
  Critical Care Monitors- Cardiac, Fetal, etc.

- **Existing Networks**

  E-Mail Systems
  Clinical Data Repository
  Master Patient Index

- **HMO/PPO/IPA/POS/MCO**

  Provider ID'S
  Diagnostic Codes

Referral Panel
Patient Demographics
Place of Service
Managed Care Financial and Administrative Systems

- **Third Party Payers**

  Eligibility
  Pre-Certification
  Referral
  Claims/Encounter
  Claims/Status

- **Pharmacies**

  Electronic Prescriptions
  Formulary Alerts
  Electronic Refills
  Drug Utilization Review
  Patient Drug Profiles
  Compliance Monitoring

- **Commercial Laboratories, Home Health Agencies and Nursing Homes**

Benefits of an IMS MEDACOM Network[2]

- **Maximize and extend the value of existing system and network investment**

  Integrate these systems and make them available to the physicians through a single existing device with an easy to use and manage presentation front end.

- **Significantly reduce lead time for transfer of time sensitive information**

  Reports and communications can be automated, without human intervention, in a near time environment. Systems that were previously unavailable can be accessed directly.

- **Reduce operating expenses:**

  Postage and transport costs
  Paper generation and management
  Staff overhead
  Forms reduction
  Reduction in telephone calls
  Eliminate interruptions and unnecessary travel to primary care facility

- **Improve operating efficiency:**

  Eliminate duplicate manual data entry
  Increase data accuracy
  Reduce patient waiting
  Facilitate timely communications
  Improve scheduling
  Speed up claims processing
  Improve receivables

- **Electronic linkage is facilitated with entities outside of the enterprise:**

  Payers
  Commercial Laboratories
  Pharmacies
  Remote databases
  Internet

- **Increased physician loyalty and satisfaction**

  Provides physicians with the tool set with which to control and manage cost of quality care while providing significant operational benefit to the practice.

- **Substantially improves quality of care and enables quality measurement in capitated and indemnity models.**

- **Enhances provider's image in its markets hence improving competitive positioning.**

Appendix G: Systematic Thinking

A Guideline to What Is Important in Managing Computers [37]

Systematic thinking in managing computers entails attention to *the process,* as well as to the *substance,* of planning, designing, and implementing modern information systems. By substance is meant the series of questions and tentative answers that guide the effort to adopt computers. Process involves both the procedure that we are attempting to improve and the actual operation of developing the computerization effort in systematic phases, carefully monitoring the actual experience as it evolves, and modifying the effort as important new questions are discovered and better tentative answers learned.

The Substance of Systematic Thinking

In terms of substance, most health care organizations have, historically employed a kind of systematic analysis for computer applications. They have generally raised questions about and addressed matters of system objectives, alternatives, impacts, and development. However, because user-managers historically have not been intimately involved in the analysis, critical nontechnical questions have received cursory treatment at best. No one has looked at how the change will be made in the actual structure of the organization and the way that the process can be improved through computerization. In particular, impact analyses have typically been limited to fiscal and technical considerations. The impact of a computer system on personnel and clients, the likelihood of resistance, and the implications for data security and privacy have often been neglected in planning and analysis. Yet, problems in these areas have frequently been the key impediments to effective use of computers. Clearly, systematic thinking on these matters is needed.

The substance of systematic thinking is asking the following types of questions and analyzing the answers:

Specification of Problem

What 's the problem that might benefit from computerization?
How is the problem area currently handled?
Why does the problem exist?
Who is involved in the problem area?
How severe is the problem for the organization?
What priority does the problem have in relation to other organizational problems?

Definition of Objectives

What do we want to accomplish?

To what extent can we accomplish it?
By when do we want to achieve the objective?

Development of Alternatives

How could we accomplish the objective?
Are there options other than computerization?
What computerization alternatives exist?
How have other organizations pursued similar objectives?
(What are the pros and cons of each alternative)

Computer Management: Impact Analysis

Fiscal Impact

What will the project cost?
How much will hardware and software cost?
How much will personnel cost?
How much will training cost?
How much will development and implementation cost?
How much will operating and maintenance cost?
What savings can be expected?
What nonquantifiable benefits can be expected?
What are the cost-benefit implications of the project?

Technical Impact

What technical expertise will be needed to develop and operate the system? Do we have that expertise? if not, where can we get it? How long will it take to get it?
How will the system affect other technical systems in the organization? Can they be made mutually supportive?
What is the -state-of-the-art"? Are pertinent technical developments likely in the near future?

Organizational Impact

How will the system affect organization structures? Will it change the information flow? In what ways? Will any reorganization be necessary or desirable?
Will the system increase or decrease anyone's power?
How might it affect informal structures, such as social groups, within the organization?
Will the system be used? How do we know?
How might resistance to the system be expressed?
Who might be threatened by and resist the system?
How would system failure affect organizational operation?
What could be done to minimize or overcome resistance?
What could be done to minimize the undesired organizational impact?

Personnel Impact

Will some existing staff no longer be needed?
How can unneeded staff be prepared for other work in the organization or be placed in another organization?
What training will be needed? Who will do it? When will it be provided? How much will it cost?
What new staff will be needed? Can they be recruited? How long
will it take to recruit them?

Legal Impact

What do current privacy and freedom of information laws require?
Can the system meet these requirements? What will this cost?
What new laws are likely, and how would they impact the system?
What legal protection can be built into contracts with vendors

Security Impact

What security risks are inherent in the system?
What security problems have other organizations experienced with similar systems?
What security protections are available to minimize the risk? How much would they cost?

Social Impact

How will the system affect the organization's clients?
How might it affect professional or health care system values?

System Development Implementation Plan

In view of the above questions and answers, what activities are required to develop and implement the system?
Who will do them?
When will they be accomplished?
How do they interrelate, and who will coordinate them)
What resources will be needed, and when will they be needed?

Computer Project Phases

A controlled process of systematic thinking recognizes that a system study is just a guess at what might and should happen and continually monitors that guess, adjusting it as new facts emerge. Such a process can be established and controlled by organizing computerization projects into distinct steps or phases that provide for conscious user-manager review and decision making at the end of each phase.

For example, a computerization project can be organized into eight phases as follows:

1. Project Initiation Phase: involves a few people and little money; focuses on initial clarification of the problem, objectives, and alternatives; obtains quick answers to basic questions.

2. Preliminary Study Phase: involves more people and money in a more detailed examination of questions; objectives and feasibility of computer options for the organization are probed.

3. System Study Phase: involves a significant investment of resources in an in-depth analysis of information needs and the formulation of a specific plan of system development; at this stage the substance of systematic thinking would be thoroughly developed as was previously discussed.

4. System Design Phase: the measures planned in the system study phase are actually designed; specialists, for example, design training programs, and users and technicians design output forms.

5. System Development/Selection Phase: hardware for implementing the design is tentatively selected; software is developed or identified.

6. Testing Phase: a key stage for controlling the project; plans and design are tried to ascertain what really happens when they are implemented; focus is on correcting any inadequate pretest answers and discovering questions not previously asked.

7. System Installation: the stage in which the major financial investment is made.

8. System Evaluation Phase: an ongoing series of reviews to see if new quest' if old answers see ions or problems have arisen, need updating, and if the system requires modification to meet organizational objectives.

The most important aspect of such a process is that at the completion of each phase the user-manager intervenes, reviews the outcome of the phase, and provides direction to proceed to the next phase, halt the project, or return to a previous stage for additional answers.

Appendix H: Medical Informatics and Computer Applications

Recommended Core Educational Guidelines for Family Practice Residents

Caregivers must be increasingly competent in their ability to access and process a growing body of information in a manner that meets the urgent needs of day-to-day patient care. Typically, only 30 percent of a physician's information needs are met in the course of office practice. Family physicians have an average of seven clinically important, unanswered questions each day. The skills needed to acquire this knowledge are essential to lifelong learning. As a corollary, the ability to evaluate and improve one's clinical performance is an essential element of quality improvement.

Medical informatics, while variably defined, is most simply the study of biomedical information and its use in decision making. It comprises the effective acquisition, distillation, interpretation, application and communication of information. In addition to the more traditional sources of information, computers now represent one increasingly important tool in managing information. Therefore, some basic familiarity with this medium is critical to ongoing growth.

Attitudes

The resident should develop attitudes that allow him or her to:

A. Appreciate the importance of the need to deal effectively with the growing body of information.
B. Accept the increasing role of computer-based technology.
C. Commit to self-directed learning principles and practice.
D. Maintain an open attitude to new sources of learning and information.
E. Value access to information at the "point of service."

Knowledge

A. The resident should understand the variety of resources available for information access:
    1. Print sources
        a. Journals
        b. Textbooks
        c. Monographs
        d. Newspapers
        e. Newsletters and survey services
    2. Computer-based sources
        a. CD-ROM
        b. Literature search sources
        c. Internet communications
        d. CME technologies

e. Awareness of electronic information resources
    (1) On-line textbooks
    (2) Bibliographic databases
    (3) Clinical simulations
    (4) Experimental technologies, such as virtual reality systems

f. Practice-based computer systems

3. Communication technologies
    a. Telecommunications
    b. Voice mail
    c. E-mail
    d. Electronic networking between hospitals and practices
    e. Medicolegal implications of these new technologies
4. Interpersonal sources
    a. Other family physicians
    b. Consultants
    c. Ancillary staff
    d. Pharmaceutical representatives
5. Practice experience

B. The resident should understand the evaluation of:
    1. Review articles
    2. Original research
    3. Meta-analysis reviews
    4. Practice guidelines
    5. Evidence-based medicine and clinical outcome analysis

C. The resident should learn which source is best for the information being sought:
    1. Answering a specific patient-related question
    2. Updating personal knowledge base, not patient-directed
    3. Balancing the cost of the process used versus the need for information

D. The resident should learn how to prioritize information

E. The resident should understand how to form an appropriate clinical question:
    1. Identify outcomes of interest
    2. Determine pertinence

F. The resident should understand how to perform a literature search

Skills

The resident should be able to:

A. Establish a method of ongoing self-assessment of learning needs

B. Identify his or her best learning style

C. Use a variety of learning methodologies, depending on information being sought

D. Evaluate the usefulness of medical information being presented
    1. Determination of validity
    2. Determination of relevance to need of physician or patient
    3. Application of experimental as opposed to clinically tested information

E. Develop basic computer skills to enhance access to timely information
    1. Keyboard competency
    2. Familiarity with commonly used operating systems (for example, Windows)
    3. Telecommunications
        a. E-mail
        b. The Internet
    4. Use of electronic learning systems, such as examinations and self-directed clinical scenarios
    5. Use of drug-interaction programs
    6. Use of on-line databases
    7. Use of the Internet
        a. Discussion forums
        b. Organizational information (for example, the AAFP, your hospital)

F. Certain advanced computer skills can enhance clinical decision making and could be mastered by those interested in furthering their individual goals.
    1. Ability to distill data into useful information [for example, use of Statistics Package for the Social Sciences (SPSS)]
    2. Application of artificial intelligence programs
    3. Use and limitations of decision support systems

Implementation

Many of the basics of these guidelines need to be taught directly through didactics with clinicians experienced in these skills and through faculty role-modeling. However, for maximal benefit, they must also be woven into the day-to-day patient care activities of the resident. Additional individualized guidance of each resident is necessary to help develop the insight needed to grow in this area. The program should attempt to allow every resident multiple opportunities to work with computers and utilize various information services before graduation.

To order reprints of the Core Educational Guideline on Medical Informatics and Computer Applications (AAFP Reprint No. 288) or to obtain a list of topics for which similar guidelines are available, call the AAFP order department at 800-944-0000 or mail your request to AAFP order department, 8880 Ward Parkway, Kansas City, MO 64114-2797.

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